ENCYCLOPÆDIA;

OR, A

DICTIONARY

OF

ARTS, SCIENCES,

AND

MISCELLANEOUS LITERATURE;

Conftructed on a PLAN,

BY WHICH

THE DIFFERENT SCIENCES AND ARTS

Are digefted into the FORM of Diftinct

TREATISES OR SYSTEMS,

COMPREHENDING

THE HISTORY, THEORY, and PRACTICE, of each,

According to the Lateft Difcoveries and Improvements;

AND FULL EXPLANATIONS GIVEN OF THE

VARIOUS DETACHED PARTS OF KNOWLEDGE,

WHETHER RELATING TO

NATURAL and ARTIFICIAL Objects, or to Matters ECCLESIASTICAL, CIVIL, MILITARY, COMMERCIAL, &c.

Including ELUCIDATIONS of the moft important Topics relative to RELIGION, MORALS, MANNERS, and the OECONOMY of LIFE:

TOGETHER WITH

A DESCRIPTION of all the Countries, Cities, principal Mountains, Seas, Rivers, &c. throughout the WORLD;

A General HISTORY, *Ancient* and *Modern*, of the different Empires, Kingdoms, and States;

AND

An Account of the LIVES of the moft Eminent Perfons in every Nation, from the earlieft ages down to the prefent times.

Compiled from the writings of the beft Authors, in feveral languages; the moft approved Dictionaries, as well of general fcience as of its particular branches; the Tranfactions, Journals, and Memoirs, of various Learned Societies, the MS. Lectures of Eminent Profeffors on different fciences; and a variety of Original Materials, furnifhed by an Extenfive Correfpondence.

THE FIRST AMERICAN EDITION, IN EIGHTEEN VOLUMES, GREATLY IMPROVED.

ILLUSTRATED WITH FIVE HUNDRED AND FORTY-TWO COPPERPLATES.

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PHILADELPHIA:

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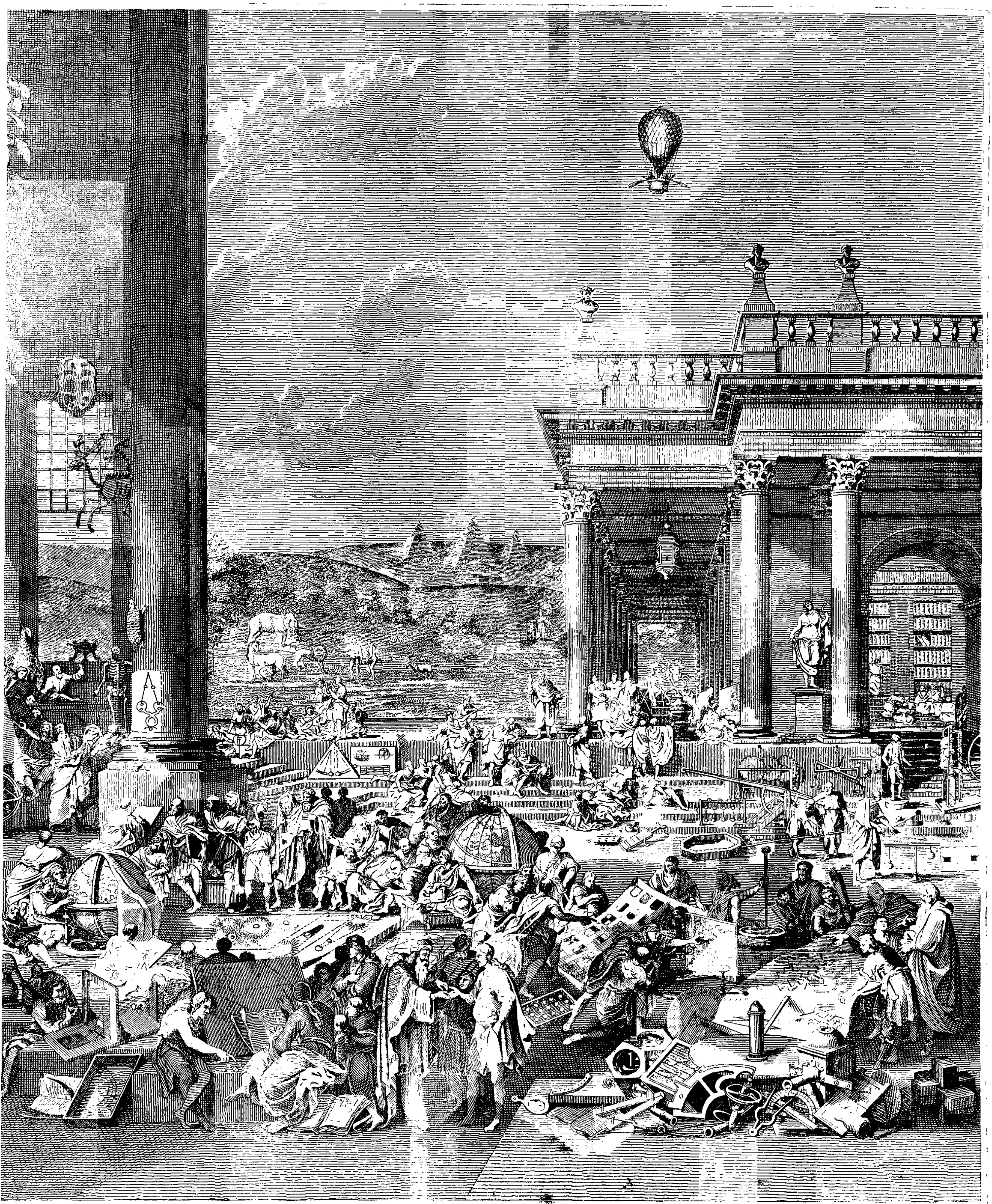
ENCYCLOPÆDIA



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TO THE

PATRONS of the Arts and Sciences; the promoters of uſeful and ornamental Literature in the United States of America, whoſe communications have enriched this extenſive and important work; and by whoſe generous encouragement this arduous enterpriſe has been brought to its completion;

The American Edition of the

ENCYCLOPÆDIA

is Dedicated,

with the moſt grateful reſpect,

by their much obliged ſervant,

THOMAS DOBSON.

PHILADELPHIA,
1798.

PREFACE.

THE utility of ſcience, and the delight which it affords to the human mind, are acknowledged by every man who is not immerſed in the groſſeſt ignorance. It is to the philoſopher that the huſbandman, the architect, the carpenter, and the ſeaman, &c. are indebted for the principles of thoſe arts, by which they furniſh us with moſt of the accommodations, and with all the elegances, of civilized life; whilſt the pleaſure experienced in the very progreſs of philoſophical reſearch is ſuch, as both reaſon and revelation intimate, not obſcurely, will conſtitute part of our happineſs in a future ſtate.

SMALL, however, would be the attainments of any man in ſcience, were they confined within the limits of his own reſearches. Our knowledge of corporeal nature originates in thoſe perceptions which we have by the organs of ſenſe; and which, treaſured up in the memory, we can, by the powers of reaſon and imagination, variouſly modify, arrange, and combine, ſo as from a number of particular truths to form to ourſelves general principles. But theſe principles would be few indeed, had each individual no other materials of which to form them than the perceptions furniſhed immediately by his own ſenſes. It has long been a matter of general regret, that the progreſs of ſcience has been ſlow and laborious; but it never could have commenced, or could have only commenced, were every man obliged to begin his career from his own ſenſations, without availing himſelf of the diſcoveries of others who have travelled over the ſame ground before him.

To this narrow field, however, philoſophical inveſtigation is not confined. By means of the arts of writing and drawing, the diſcoveries of one individual may be made acceſſible to another, and the ſcience of every age and of every country treaſured up for the uſe of ages and countries the moſt remote. Hence ariſes the utility of what is generally called *literature*, or the knowledge of the languages, cuſtoms, and manners, which have prevailed among the various nations of the earth. Without this knowledge the ſcience of the ancients would be locked up from the moderns; and even the diſcoveries of modern nations would be inacceſſible to each other.

WITH all the aid which can be furniſhed by one age or nation to another, the labours of the philoſopher ſtill preſent themſelves as immenſe and difficult. His object comprehends univerſal nature, of which nothing can be known but by ſenſation and reflection; but the objects of ſenſe are all individuals, almoſt infinite in number, and for ever changing: ſo that inſtead of a ſyſtem of ſcience, the firſt view of the corporeal world would lead us to imagine, that from our moſt diligent reſearches nothing could be obtained but a vaſt collection of particular truths. Such a collection, whilſt it would burden the memory, could be of little advantage to the arts of life; for we are very ſeldom brought, on different occaſions, into circumſtances ſo perfectly ſimilar, as to require, without the ſmalleſt variation, the ſame conduct.

But though all the objects of senfe, of memory, and of confcioufnefs, are unqueftionably individuals diftinct from each other, the contemplative mind of man obferves among them various refemblances and analogies. It obferves, that the fenfation communicated to the fight by fnow is fimilar to that communicated by milk, paper, chalk, and a thoufand other objects; that all external objects are folid, extended, divifible, and of fome figure; that the path defcribed by a planet round the fun refembles that defcribed by a cannon ball over the furface of the earth; and that many of the actions of brutes are fimilar to thofe which we are impelled to perform by the internal feelings of defire and averfion.

This view of nature, quiefcent and active, fuggefted to the philofopher the expediency of ftudying the vaft multitude of objects which compofe the univerfe; not individually, but in groups claffed together according to their perceived refemblances or analogies. He faw that his labour would thus be at once fhortened and rendered infinitely more ufeful; but he likewife faw, or ought to have feen, that it would by no means be taken wholly away. Much cautious attention is requifite to clafs objects in human fyftems as they are in fact claffed in the fyftem of nature. Analogies are apt to be miftaken for refemblances; a refemblance in a few particulars for a refemblance in all; and events, which have in reality very little in common, to be attributed to the fame or fimilar caufes. Thefe miftakes can be avoided only by a painful induction of facts, by means of experiments accurately made on individual objects; and it was but very lately that induction was employed as the inftrument of fcientific refearch.

In ancient Greece, where philofophy firft affumed a fyftematic form, all the objects of human thought were ranged under ten CATEGORIES or PREDICAMENTS; and every thing which could be affirmed or denied of thefe categories was fuppofed to be comprehended under five claffes called PREDICABLES. Among the Greek philofophers, therefore, the ufe of induction was to afcertain the category to which any particular object belonged; after which, nothing more was to be done but, by a fhort procefs of fyllogiftic reafoning, to affirm or deny of that object whatever could be affirmed or denied of its category.

To this ancient arrangement of human knowledge many infuperable objections have been urged. But it muft be confeffed, that the arrangements which have been propofed in its ftead, by the fages of modern times, have little claim to greater perfection. Locke claffed all things under three categories; SUBSTANCES, MODES, and IDEAS. Hume reduced the number to two; IMPRESSIONS and IDEAS. The former of thefe philofophers admitted of only four predicables, all different from thofe of the ancients; the latter at firft extended the number to feven, but afterwards reduced it to three; among which none of the ancient predicables are to be found, and only one of thofe which had been admitted by Locke.

These different claffifications of knowledge are the natural confequences of mens attempting what the greateft powers of the human intellect will never be able to accomplifh. It certainly was the aim of Ariftotle, or whoever was the inventor of the categories and the predicables, to delineate the whole region of human knowledge, actual and poffible; to point out the limits of every diftrict; and to affign to every thing which can be the object of human thought its proper place in the vaft arrangement. Such an attempt evinces the ambition of its author: nor has the ambition been much lefs of fome of thofe by whom the rafh arrogance of the Stagyrite has been moft feverely cenfured. Locke fays exprefsly, that as the objects of our knowledge are confined to *fubftances*, *modes*, and *ideas*, fo we can difcover nothing of thefe, but 1*ft*, their *identity* or *diverfity*; 2*d*, their *relation*; 3*d*, their *co-exiftence* or *neceffary connection*; and 4*th*, their *real exiftence*: while Hume declares, with fome hefitation indeed, that we can know nothing but the *refemblance*, *contiguity* in time or place, and *caufation* of our impreffions and ideas.

These

THESE attempts, as well modern as ancient, to contract the whole furniture of the human mind into the compafs of a nut-fhell, and to give at once a compleat chart of knowledge, have been cenfured, not only as prefumptuous, but as the fertile fources of error, by a philofopher whofe writings do honour to this age and nation. "To make a perfect divifion (fays Dr Reid), a man muft have a perfect comprehenfion of the whole fubject at one view. When our knowledge of the fubject is imperfect, any divifion we can make muft be like the firft fketch of a painter, to be extended, contracted, or mended, as the fubject fhall be found to require. Yet nothing is more common, not only among the ancient but even among modern philofophers, than to draw from their incomplete divifions, conclufions which fuppofe them to be perfect. A divifion is a repofitory which the philofopher frames for holding his ware in convenient order. The philofopher maintains, that fuch or fuch a thing is not good ware, becaufe there is no place in his ware room that fits it. We are apt to yield to this argument in philofophy, but it would appear ridiculous in any other traffic."

THE truth of thefe obfervations will be controverted by no man who is not an abfolute ftranger to the various fyftems, ancient and modern, of what has been called *the firft philofophy*.

BUT if every fcientific arrangement of knowledge which has hitherto been propofed be fo very imperfect,—what judgment are we to form of that which is adopted by the compilers of Dictionaries or Encyclopædias, in which the arts and fciences are arranged according to the order of the alphabet, and A, B, C, &c. confidered as the categories? The author whom we have juft quoted affirms, that of all methods of arrangement this is the moft antiphilofophical; and if he allude only to fuch Encyclopædias as are mere dictionaries, in which the feveral arts and fciences are broken into fragments, fcattered through the work according as the alphabet has happened to difpofe of the various technical terms which have place in each, his affertion is unqueftionably true. Its truth is indeed admitted by Chambers himfelf, the compiler of one of the firft and moft valuable of thefe dictionaries, who fpeaks of the works of his predeceffors as containing nothing but a multitude of materials, or a confufed heap of incoherent parts. "Former lexicographers (fays he) fcarce attempted any thing like ftructure in their works; they feem not to have been aware that a dictionary is in fome meafure capable of the advantages of a continued difcourfe: and hence it is, that we fee nothing like a whole in what they have done."

PROPOSING to remedy this defect in his own Dictionary of Arts and Sciences, he informs us, that "his view was to confider the feveral matters, not only in themfelves, but relatively, or as they refpect each other; both to treat them as fo many wholes, and as fo many parts of fome greater whole; and to point out their connection with each other, and with that whole, by reference: fo that by a courfe of references from generals to particulars, from premifes to conclufions, from caufe to effect, and *vice verfa*, a communication might be opened between the feveral parts of the work, and the detached articles be in fome meafure replaced in the natural order of fcience, out of which the alphabetical order had removed them." To enable the reader with the greater eafe to replace in the order of fcience the various articles fcattered through the dictionary, he furnifhed him in the preface with what muft be confidered as an elegant analyfis of human knowledge; by which may be feen, at one view, the mutual dependence of the feveral parts upon each other, and the intimate connection of the whole.

BUT though the found judgment of Mr. Chambers thus directed him to make the arrangement of his Cyclopædia vaftly preferable to that of any work of the fame kind which had been publifhed before it; we are afraid that, in its original form, it was ftill liable to the objections of Dr Reid. Had all the articles in the work been treated in fufficient detail to conftitute, when reunited in the order of fcience, fo many complete fyftems; yet the multitude of references was fo great, that this reunion could not have been made but by a degree of irkfome labour, to which few readers will ever fubmit (A). The work therefore, with all its improvements, was ſtill a book of ſhreds and patches, rather than a ſcientific dictionary of arts and ſciences; and conſidering the letters of the alphabet as the categories, the arrangement was certainly inconvenient as well as antiphiloſophical.

Of this inconveniency, inſeparable from a mere *dictionary* of arts and ſciences, the original Compilers of the Encyclopædia Britannica were fully aware; and they reſolved to conſtruct their own Work upon a plan from which it might be completely removed. They were equally appriſed with their predeceſſors of the utility of explaining by itſelf every technical term, and of illuſtrating every particular topic, in the wide circle of the arts and ſciences; but they were at the ſame time ſenſible, that it is only by thinking in method, and reducing their ideas to the order of nature, that mankind can make

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(A) To be convinced of the truth of this aſſertion, one needs but to caſt his eye over the author's table of arrangement. It is as follows.

KNOWLEDGE is either

- *Natural* and *Scientifical*; which is either —
  - *Senſible*; conſiſting in the perception of phenomena or external objects—called Physiology or Natural History; and which, according to the different kinds of ſuch objects, divides into—
    - Meteorology.
    - Hydrology.
    - Mineralogy.
    - Phytology.
    - Zoology.
  - Or,
  - *Rational*; conſiſting in the perception of the intrinſic characters or habitudes of ſenſible objects—either their —
    - *Powers*, and *Properties*—call Physics, and Natural Philosophy.
    - *Abſtracts*—called Metaphysics, which ſubdivides into
      - Ontology.
      - Pneumatology.
    - *Quantities*—called Pure Mathematics—which divides, according to the ſubject of the quantity, into —
      - Arithmetic—whence
        - Analytics.
        - Algebra.
      - Geometry—whence
        - Trigonometry.
        - Conics.
        - Spherics.
      - Statics ——
    - *Relations* to our happineſs—called Religion, or the doctrine of Offices, which ſubdivides into
      - Ethics, or Natural Religion—whence
        - Politics.
        - Law.
      - Theology, or Revelation.
- Or,
- *Artificial* and *Technical*, (conſiſting in the application of natural notices to farther purpoſes), which is either —
  - *Internal*; employed in diſcovering their agreement and diſagreement; or their relations in reſpect of truth called Logics.
  - Or,
  - *External*; which is either
    - *Real*, employed in diſcovering and applying the
      - *Latent powers* and *properties* of bodies—called Chemistry—whence
        - Alchemy.
        - Natural Magic, &c
      - *Quantities* of bodies — called Mixed Mathematics; which, according to the different ſubjects, reſolves into ——
        - Optics, Catoptrics, Dioptrics, — whence
          - Perspective.
          - Painting.
        - Phonics—whence Music.
        - Hydrostatics, Hydraulics.
        - Pneumatics.
        - Mechanics—whence
          - Architecture.
          - Sculpture.
          - Trades and Manufactures.
        - Pyrotechnia—whence
          - The Military *Art*.
          - Fortification.
        - Astronomy —whence
          - Chronology.
          - Dialling.
        - Geography, Hydrography—whence
          - Navigation.
          - Commerce.
      - *Structure* and *economy* of organical bodies, called Anatomy.
      - *Relations* thereof to the preſervation and improvement — either of —
        - Animals——called
          - Medicine.
          - Pharmacy.
        - Vegetables—called
          - Agriculture.
          - Gardening.
        - Brutes—— called
          - Farrying.
          - Manege—whence
            - Hunting.
            - Falconry.
            - Fishing, &c.
    - Or,
    - *Symbolical*, employed in framing and applying
      - *Words*, or articulate ſigns of ideas—called Grammar.
      - *Armories*—called Heraldry.
      - *Tropes* and *Figures*—called Rhetoric.
      - *Fables*—called Poetry.

Such

make any progreſs in uſeful knowledge. To accompliſh therefore effectually what Mr Chambers by means of his prefatory ſcientifical analyſis attempted in vain, they endeavoured to give a compendious, yet clear and ſatisfactory, account of the ſeveral arts and ſciences under their proper denominations, whilſt the ſubordinate articles in each were likewiſe explained under their technical terms. Theſe ſubordinate articles they divided into three kinds; of which the firſt conſiſts of ſuch as, independent of particular ſyſtems, admit of a full and complete illuſtration under their proper names; the ſecond, of ſuch as require to be partly diſcuſſed under the ſyſtems to which they belong, and partly under their own denominations; and the third, of ſuch as appertain to ſyſtems of which all the parts muſt be elucidated together. Articles of the firſt kind admit of no references; thoſe of the ſecond, being only partially explained under their proper denominations, demand references to the ſyſtems where the illuſtrations are completed; and thoſe of the laſt are wholly referred to the ſyſtems of which they are conſtituents.

Such has been the arrangement of the Arts and Sciences in every edition of the Encyclopædia Britannica; and it ſurely falls not under that cenſure which Dr Reid pronounced with juſtice on many other works bearing a ſimilar title.

In the ſpirit of true philoſophy, that great man obſerves, that the ſame ſubject may admit, and even require, various diviſions, according to the different points of view from which it is contemplated; and we doubt not but, if he had been aſked, he would candidly have acknowledged, that the diviſions and arrangement of the Encyclopædia Britannica are calculated to anſwer every purpoſe which can be expected from a general repoſitory of arts, ſciences, and miſcellaneous literature. They are ſuch as muſt give to readers of every deſcription the moſt eaſy acceſs to the objects of their purſuit; for whilſt the philoſopher or ſyſtematic artiſt may be fully and regularly informed by turning to the general name of the ſcience or art which he wiſhes to explore, the man who has occaſion to conſult only particular topics will find them illuſtrated under the terms by which they are denominated. Contemplated from this point of view, the arrangement of the Encyclopædia Britannica needs not ſhrink from a compariſon even with that of the *Encyclopédie Methodique*; for though that voluminous work, conſiſting of a dictionary of dictionaries, may have the appearance of being more ſyſtematically arranged; yet we, who have had occaſion to conſult it frequently, have never found our object the more readily for having been obliged to travel in queſt of it through different alphabets.

A dictionary, in which the ſeveral arts and ſciences are digeſted into diſtinct treatiſes or ſyſtems, whilſt the various detached parts of knowledge are explained in the order of the alphabet, ſeems indeed to have received the beſt form of which ſuch a work is ſuſceptible; and may certainly be made to anſwer one end, which more philoſophical arrangements never can accompliſh. Under the various letters of the alphabet, it is obvious that the whole circle of the ſciences may be completely exhauſted; and that every diſcovery, ancient or recent, may be referred to the particular ſyſtem which it tends

Such is that great and general analyſis of knowledge, which has by ſome of our correſpondents been recommended to us in terms of the higheſt praiſe, and to which elegance and accuracy cannot perhaps be refuſed. Its utility, however, as prefixed to a dictionary of arts and ſciences, is not very apparent. From each word, which in this table is printed in capitals, many branches are made to ſpring, which in the dictionary are all treated as ſeparate articles. Thus from Meteorology we are referred, in a ſubordinate analyſis, to Air and the Atmosphere: including, 1ſt, The hiſtory of its contents, Æther, Fire, Vapour, Exhalation, &c. 2d, Meteors formed therein; as Cloud, Rain, Shower, Drop, Snow, Hail, Dew, Damp, &c. Rainbow, Parhelion, Halo, Thunder, Waterspout, &c. Winds, Monsoon, Hurricane, and the like. As every word printed in capitals, as well in this ſubordinate diviſion as in the general table, is the title of an article treated ſeparately in the Cyclopædia, we muſt turn backwards and forwards through more than 24 references before we come at the detached topics, which we are directed to unite into a ſyſtem of Meteorology. The number of articles which muſt be united in the ſame manner to conſtitute the Compiler's ſyſtem of Metaphysics is upwards of 48; and thoſe which are referred to Theology above 300!

tends to confute or to confirm, without having recourſe to the awkward expedient of employing ſeveral alphabets, or the ſtill more inconvenient arrangement by which the ſyſtems themſelves are broken into fragments.

But on this topic it is needleſs to expatiate. The very favourable reception with which the two former editions of the Encyclopædia Britannica were honoured by the Public; the ſtill greater encouragement which has been given to the preſent; and the adoption of the plan by the editors of other repoſitories of arts and ſciences—bear ample teſtimony to the excellence of the arrangement. On this ſubject we expreſs ourſelves with the greater eaſe and the greater confidence, that we cannot be accuſed of flattering our own vanity, or publiſhing our own praiſes; for the merit of forming the arrangement, as well as of introducing into the work various branches of knowledge, from which, as they are not generally to be found in dictionaries, it derives a juſt claim to the favour of the Public, belongs not to the Compilers of the preſent Edition.

After ſurveying any particular art or ſcience, our curioſity is excited to acquire ſome knowledge of the private hiſtory of thoſe eminent perſons by whom it was invented, or has been cultivated and improved. To gratify this curioſity, thoſe who formed the plan of the Encyclopædia Britannica reſolved to enrich it with a department not to be found in any prior collection of the ſame kind except the French *Encyclopédie*.

Of all the various ſpecies of narrative-writing, it is acknowledged that none is more worthy of cultivation than BIOGRAPHY; ſince none can be more delightful or more uſeful, none can more certainly enchain the heart by irreſiſtible intereſt, or more widely diffuſe inſtruction to every diverſity of condition. Its tendency to illuſtrate particular paſſages in general hiſtory, and to diffuſe new light through ſuch arts and ſciences as were cultivated by the perſons whoſe lives are related, are facts too obvious to require proof. It exhibits likewiſe the human character in every poſſible form and ſituation. It not only attends the hero through all the buſtle of public life, but purſues him to his moſt ſequeſtered retirements. It ſhows how diſtinguiſhed characters have been involved in misfortunes and difficulties; by what means they were extricated; or with what degree of fortitude and dignity they diſcharged the various functions, or ſuſtained the viciſſitudes, ſometimes proſperous and ſometimes adverſe, of a checquered and a fluctuating life. In ſuch narratives men of all ranks muſt feel themſelves intereſted; for the high and the low, as they have the ſame faculties and the ſame ſenſes, have no leſs ſimilitude in their pains and pleaſures; and therefore in the page of honeſt biography, thoſe whom fortune or nature has placed at the greateſt diſtance, may mutually afford inſtruction to each other. For theſe reaſons it is, that every man of learning and taſte has eſteemed the biographical labours of Plutarch among the moſt valuable and intereſting remains of antiquity.

The lives and characters, therefore, of ſuch perſons as have excelled in the arts either of war or of peace, of ſuch as have diſtinguiſhed themſelves either on the theatre of action or in the receſs of contemplation, will be found in the Encyclopædia Britannica alphabetically diſpoſed under their proper names. Many indeed are omitted, for whom the reader will naturally look; ſome becauſe, in the order of the alphabet, we had paſſed the initial letters of their names before we had intelligence of their deaths; others, through the inadvertency, whether excuſable or not, of the Editors; ſeveral, for a reaſon which ſhall be afterwards aſſigned for omiſſions of a different kind, and perhaps of greater importance; and a very few from the contemptuous refuſal of their friends to anſwer the Editor's letters reſpectfully requeſting the neceſſary information (B).

But

(B) Of this treatment we have not indeed often had occaſion to complain. While men of the firſt eminence in church and ſtate have readily anſwered the letters that were addreſſed to them, and either communicated the in-

But while one part of our readers will regret that we have given no account of their favourite philofopher, hero, or ftatefman, others may be difpofed to remark, that we have dragged from obfcurity the names of many perfons who were no proper objects of fuch public regard. To thefe we can only reply, that, with the greateft biographer of modern times, we have long thought that there has rarely paffed a life of which a faithful narrative would not be ufeful; and that in the lives of the moft obfcure perfons, of whom we have given any account, we faw fomething either connected with recent difcoveries and public affairs, or which we thought capable of affording a leffon to great multitudes in fimilar circumftances.

Between eminent atchievements and the fcenes where they were performed, there is a natural and neceffary connection. The character of the warrior is connected with the fields of his battles; that of the legiflator, with the countries which he civilized; and that of the traveller and navigator, with the regions which they explored. Even when we read of the perfons by whom, and the occafions on which, any particular branch of knowledge has been improved, we naturally wifh to know fomething of the places where fuch improvements were made. This curiofity, fo natural and fo laudable, has been frequently felt by ourfelves during the compilation of this Work; and to gratify it in others, we have fubjoined to the name of every confiderable place an account of its fituation, its climate, its foil, its peculiarities, its inhabitants, with their manners, cuftoms, and arts; its revolutions, laws, and government, with whatever elfe appeared neceffary for the readers information, and at the fame time admiffible into a work of fuch variety and extent. It is indeed probable, that by many of our readers we fhall be thought to have done too much rather than too little in this department; and to have filled our pages with accounts of towns and villages not of fufficient importance to demand general attention. But were it known how many of fuch places we have excluded from our Work, though recommended to us by fome of our moft obliging correfpondents, thofe who reflect upon the different taftes of mankind, and confider that we wrote for the Public at large, would forgive us for having occafionally employed a few fentences in the defcription of others, which, whatever be their real importance, could not have been omitted without difappointing a very numerous clafs of readers.

The knowledge of hiftory is fo important, not only to the ftatefman and the legiflator, to whom indeed it is abfolutely neceffary, but likewife to every man who moves in a fphere above that of the loweft vulgar, that a Work profeffing to be a general repofitory of arts, fciences, and literature, would be exceedingly defective, if it did not contain fome information of the tranfactions of thofe who have been in poffeffion of the world before us; of the various revolutions of ftates and empires; and of all the other means which have contributed to bring every thing into the ftate in which we behold it. Fully aware of this, the compilers of the Encyclopædia Britannica, befides giving a general view of univerfal hiftory and chronology, have enriched this edition with a fhort, though they hope luminous, detail of the progrefs of each particular nation, which from the remoteft period to the prefent time has acted a confpicuous part on the theatre of the world. The reader therefore will here find a very comprehenfive view of Civil History, ancient and modern, in all its branches. Nor have the hiftories of Nature and Religion been neglected. Of the former, it is not perhaps too much to fay, that in all the fubdivifions of its three great kingdoms, it will be found more fully, more accurately, and more fcientifically, detailed in this Work than in any other dictionary which has yet been publifhed. Of the latter, a brief view is given under the general article History; the unavoidable defects of which are in a great meafure

 fupplied

information which was requefted, or politely affigned reafons for wifhing the lives of their friends not to be publifhed in the Encyclopædia Britannica, the Editor recollects but two men, who maintained a fullen filence; and thefe he cannot confider as moving in a fphere much higher than his own.

ſupplied by the accounts that will be found, under their proper denominations, of all the conſiderable ſects and opinions which have prevailed in the religious world from the earlieſt periods to the preſent day.

SUCH was the plan of the ſecond edition of the Encyclopædia Britannica; to which, as it ſeems hardly capable of improvement, the Compilers of the third have, with a few ſlight variations, ſtrictly adhered. Still, however, there was ample room for the efforts of all their induſtry and all their learning; for the rapid progreſs of the phyſical ſciences had rendered the labours of their predeceſſors in many departments uſeleſs. Beſides the introduction of ſome thouſands of new articles, there are not many of great importance, thoſe in biography and geography alone excepted, which ſtand in this Edition as they ſtood in the laſt. Such recent diſcoveries as could be introduced, have been mentioned with reference to their proper authors; and, while the ſeveral ſciences have been treated more fully and ſyſtematically, greater care has been employed to trace the hiſtory of each from its firſt invention, and to apply them all to the arts of life.

To accompliſh a taſk ſo arduous and ſo important, neither labour nor expence has been ſpared. Literary journals; the memoirs and tranſactions of philoſophic ſocieties; and all the moſt valuable dictionaries of arts and ſciences, both in our own and in other languages, have been conſtantly conſulted. The works of the moſt eminent authors, as well ancient as modern, who have written on any particular art or ſcience, have been collected and compared. Such of them as treat of topics, about which there is no room for controverſy, and are at the ſame time ſuſceptible of abridgment, have been abridged with the greateſt care; whilſt others, more conciſe and tenacious of their ſubjects, have been more cloſely purſued and more faithfully retained. Upon thoſe branches of ſcience on which the works of other authors furniſhed nothing fit for the purpoſe of the Editors, original eſſays and treatiſes are inſerted, which were compoſed either by themſelves, or by ſuch of their friends as they knew to be intimately acquainted with the ſubject. On diſputed points, whether in the phyſical or moral ſciences, arguments and objections have been diſplayed in their full force; and of each of the various ſects into which the Chriſtian church is divided, the account is generally given by the moſt eminent clergyman of that ſect to whom the Editors could find acceſs.

AFTER the utmoſt exertions, however, of our attention and induſtry, we are ſenſible, perhaps more ſenſible than any of our readers, that the Work paſſes from our hands in a ſtate far from perfection; and that the man who ſhall not diſcover in the Encyclopædia Britannica miſtakes, needleſs repetitions, and even culpable omiſſions, will bring to the examination of it no great ſtock of general knowledge. But for theſe offences the Editors perhaps need no other apology than what will be furniſhed by the nature of the Work and the hiſtory of its publication.

IN a collection ſo extenſive and multifarious, a few miſtakes, repetitions, and omiſſions, might ſurely be paſſed over without ſeverity of cenſure, although the publication had from the beginning to the end been ſuperintended by the ſame man; but they will be allowed to have been almoſt unavoidable, when it is known that, after the Work was far advanced, it was committed to the care of a new Editor, who, though he was in a great degree a ſtranger to the contents of the printed volumes, found no clue of his predeceſſor's which could guide him accurately through thoſe to be compiled.

WE beg it to be underſtood, that this obſervation is not made with a view to remove any ſhare of blame from the ſecond to the firſt Editor; for Mr Colin Macfarquhar, who conducted the publication beyond the middle of the twelfth volume, was a man whom few who knew him will be diſpoſed to blame, and on whoſe induſtrious integrity thoſe who knew him beſt muſt admit that it would be difficult to beſtow too much praiſe. Born in Edinburgh of parents reſpectable, though not affluent, he was, at an early period of life, bound an apprentice to a printer. This profeſſion gave him a taſte for ſcience and literature, or rather furniſhed him with oppor-

tunities

tunities of cultivating the taſte which he derived from nature: and he ſoon became well acquainted with the moſt popular writers in natural hiſtory and in natural and moral philoſophy. When he opened a printing-houſe of his own, rectitude of conduct quickly recommended him to friends and to employment; and the unremitted proſecution of his ſtudies eminently qualified him for ſuperintending the publication of a new dictionary of arts, ſciences, and literature; of which, under the title of ENCYCLOPÆDIA BRITANNICA, the idea had been conceived by him and his friend Mr Andrew Bell engraver. By whom theſe gentlemen were aſſiſted in digeſting the plan which attracted to that Work ſo much of the public attention, or whether they had any aſſiſtance, are queſtions in which our readers cannot be intereſted. Suffice it to ſay, that Mr Macfarquhar had the ſole care of compiling the preſent Edition; and that, with the aid of a very few literary friends, he brought it down to the article MYSTERIES, in the twelfth volume, when he was cut off in the 48th year of his age by a death which, though not ſudden, was perhaps unexpected. His career was indeed ſhort; but of him it may be ſaid with as much propriety as of moſt men, *Nemo parum diu vixit, qui virtutis perfectæ perfecto functus eſt munere.*

AMONG his literary correſpondents was the Reverend Dr Gleig of Stirling, who had written for him various articles, of which ſome were publiſhed during his lifetime and others in their order after his death. Theſe ſhall be afterwards enumerated with thoſe furniſhed by other occaſional contributors; but they are mentioned at preſent, becauſe they account for that partial regard of Mr Macfarquhar for their author, which, on the death of the former, induced the truſtees for his children, together with Mr Bell the ſurviving partner, to requeſt the latter to undertake the taſk which their deceaſed friend had hitherto diſcharged with ſo much credit to himſelf. In this propoſal, after ſome heſitation on account of his diſtance from Edinburgh, Dr Gleig acquieſced; but when he entered on his new office, he found matters in a ſtate of no little confuſion. Mr Macfarquhar, though his death had not been long expected, had laboured long under a complication of diſeaſes; the conſequence of which was, that the materials which he had prepared for the preſs were almoſt exhauſted; and of thoſe which were firſt called for, ſome had not paſſed through his correcting hand.

THIS circumſtance may perhaps account for ſome defects and inaccuracies in that part of the Work, to which the ſecond Editor looks back with the leaſt ſatisfaction: but that which muſt be his apology for ſeveral repetitions and omiſſions, was the neglect of his predeceſſor during his laſt illneſs to make an intelligible index to his own labours. From the want of ſuch a neceſſary guide, Dr Gleig was perpetually liable, notwithſtanding his utmoſt circumſpection, to give under one title an explanation of ſubjects which had been before explained under another; and to omit articles altogether, from a perſuaſion that they had been diſcuſſed in ſome preceding volume under the general ſyſtem to which they belong.

NEITHER his repetitions nor omiſſions, however, are ſo many as ſome have ſuppoſed them; for what has been haſtily cenſured as a repetition, is frequently nothing more than the neceſſary reſumption of ſome important ſubject. Availing himſelf of the excellence of the plan upon which the Encyclopædia Britannica is conſtructed, he took the opportunity, when he found any ſyſtem ſuperficially treated, to ſupply its defects under ſome of the detached articles belonging to it. Of this he ſhall mention as one inſtance HYDROSTATICS; which, conſidered as a ſyſtem, muſt be confeſſed to be defective; but he truſts that its defects are in a great meaſure ſupplied under the ſeparate articles RESISTANCE *of Fluids*, RIVER, SPECIFIC *Gravity*, and *Water*-WORKS.

THAT in the Encyclopædia Britannica no account is given of ſome things which ſhould have a place in a general repoſitory of arts, ſciences, and miſcellaneous literature, muſt be acknowledged; but it muſt likewiſe be acknowledged that ſuch omiſſions are neither numerous nor very important; for many ſubjects, which have been ſuppoſed to be omitted, are treated under titles different from thoſe under which they have

have been looked for. Thus the method of calculating compound interefts, which one of our correfpondents cannot find in our Work, is taught in the article ALGEBRA; that of coating mirrors, of which another complains that no account is given, will be found under the term FOLIATING; and though it may be true, according to the peevifh remark of a third, that the reader is nowhere directly inftructed how to grind optical glaffes, yet if he read the article GLASS-*Grinding*, and underftand the doctrine of lenfes as laid down in the article OPTICS, he will eafily, if an artift, difcover a method of performing that operation for himfelf.

OMISSIONS, however, there are towards the end of the Work; not the confequence of careleffnefs, but the offspring of neceffity.

IN an addrefs to the Purchafers of the Encyclopædia Britannica, fubjoined to the ninth volume, the proprietors gave a rafh promife to comprehend the whole of their undertaking within the limits of eighteen; and if intervening difcoveries fhould make it neceffary, to enlarge the laft volumes in quantity without any additional charge to Subfcribers.

THAT the promife was rafh, a moment's reflection fhould have taught them; for in the prefent rapid progrefs of phyfical fcience, when new difcoveries are daily made, it was obvioufly impoffible, at fo early a period, to afcertain with precifion how many volumes would be neceffary to bring a Work of fuch comprehenfive variety to the utmoft perfection of which it is capable. This was indeed foon difcovered; but the proprietors fhrunk not from their engagement, which they determined to fulfil to the utmoft extent of its meaning, till the additional tax, which in 1795 was laid upon paper, involved them in difficulties which they had not forefeen. By the act of parliament they were indeed authorifed to reimburfe themfelves by raifing the fubfcription-price of their volumes; but they chofe rather to fubmit to a diminution of profit, than to take even a legal advantage of that Public by which they had hitherto been fo generoufly fupported.

To complete their plan, however, in its original extent, was now impoffible, without a violation of the facred duties which they owe to themfelves and to their families. In this dilemma the Editor propofed that they fhould ftate the cafe to their Subfcribers, of whom he is confident that nine-tenths would have releafed them from the obligation of their promife: but after long deliberation, they judged that it would be more acceptable to the public at large to comprehend the Work in the propofed number of volumes, though they fhould exclude from the laft fuch articles as might be omitted without injury to fcience or the arts of life. If by any of their readers they fhall be thought to have erred in this judgment, let them not, however, be too feverely blamed; for they have done much to adhere to the fpirit of their promife; and, in the large addition made to the bulk of the laft volume, have fhewn that they prefer their honour to their intereft. Several things have indeed been excluded; but except fuch recent difcoveries as could not be noticed under the laft letters of the alphabet, it is believed that very little has been omitted which can be confidered as of great or general importance. At any rate, the Editor flatters himfelf, that the laft fix volumes of the Encyclopædia Britannica do not difgrace thofe by which they are preceded, and that the whole will bear to be compared with any other Work of the fame kind extant. Imperfect it certainly is: "but if much has been omitted, let it be remembered that much has likewife been performed;" that perfection is not to be looked for in the works of man; and that every compilation of fuch variety and extent fhould be examined with the fpirit which actuated one of the greateft critics of antiquity when perufing the works of his brother poets:

Verum ubi plura nitent in carmine, non ego paucis
Offendar maculis, quas aut incuria fudit,
Aut humana parum cavit natura.—— HOR. DE ART. POET.

W

We mentioned our obligations to occasional contributors; and many of our correspondents have expressed an earnest desire to know who these contributors have been. As there can be no impropriety in gratifying such a desire, we shall conclude this Preface, by assigning the various articles, not compiled by the Editors themselves, to their respective authors: but as many of the writers for the first twelve volumes were known to Mr. Macfarquhar alone, they will not attribute the omission of their names to culpable design, but to irremediable ignorance.

For whatever instruction may be conveyed in the articles ANATOMY and SURGERY the Public is indebted to Andrew Bell, F. S. S. A. one of the proprietors, and the ingenious Mr Fyfe. From the former of these gentlemen the world will soon receive one of the most splendid anatomical works which it has yet seen; and as the latter has long officiated under Dr Monro as dissector in the anatomical school of the university of Edinburgh, it is needless for us to say how well he must be acquainted with the subjects on which we employed him to write. AEROLOGY, AEROSTATION, CHEMISTRY, ELECTRICITY, GUNNERY, HYDROSTATICS, MECHANICS, METEOROLOGY, with most of the separate articles in the various branches of natural history, we have reason to believe were compiled by Mr James Tytler chemist; a man who, though his conduct has been marked by almost perpetual imprudence, possesses no common share of science and genius. The article BLIND was furnished by Dr Blacklock and Dr Moyes, both blind themselves, and both men of superior attainments; the former in elegant literature, and that latter in the physical sciences. We believe that the article EDUCATION was composed by Mr Robert Heron, author of a history of Scotland now publishing, who likewise furnished the greater part of what we have published under the titles RELIGION and SOCIETY. The lives of JOHNSON and MARY *Queen of Scots*, with the articles INSTINCT, LOVE, METAPHYSICS, MIRACLE, the history Ethics under MORAL PHILOSOPHY, OATH, PASSION, PLASTIC NATURE, POLYTHEISM, PRAYER, SLAVERY, and SUPPER *of the Lord*, were contributed by Dr Gleig, Editor of the last six volumes; GRAMMAR (c) and THEOLOGY by Dr Gleig and the Reverend James Bruce, A. B. late of Emanuel College, Cambridge; and MOTION by Dr Gleig and Mr Tytler. The system of MEDICINE, which was published in the former edition, was revised and improved for the present by Andrew Duncan, M. D. Fellow of the Royal Society of Edinburgh, and Professor of the Institutes of Physic in the University. The notes to the article MUSIC were contributed by Dr Blacklock, and the history of the art by William Maxwell Morison, Esq; advocate, who likewise favoured us with what we have published on the science of PHYSIOGNOMY. The articles MYSTERIES, MYTHOLOGY, and PHILOLOGY, we owe to the erudition of David Doig, L. L. D. F. S. S. A. master of the grammar-school of Stirling, and author of two very ingenious *Letters on the Savage State*, addressed to the late Lord Kames. NAVIGATION, PARALLAX, PENDULUM, PROJECTION *of the Sphere*, SHIP-BUILDING, and *Naval* TACTICS, were furnished by Andrew Mackay, L. L. D. F. R. S. E. of Aberdeen, and known to the Public as author of a treatise on *the Theory and Practice of finding the Longitude*

(c) Mr Bruce, who communicated the most valuable parts of the article GRAMMAR, and who was for many years a student in the university of St Andrew's, wishes, from gratitude to his old master, to declare, in this public manner, that, to the instructions of Dr Hunter, professor of humanity in that university, he is indebted for much of what philological knowledge he may possess. We believe indeed that Dr Hunter may claim as his own the theory which we have given of the cases of nouns, the doctrine concerning the inverse acceptation of the adjective, and the resolution of the relative pronoun by means of the preposition *of* instead of the conjunction *and*. There is nothing else in our article which the attentive reader may not find in the grammatical writings of *Vossius*, *Scaliger*, *Sanctius*, *Perizonius*, *Wallis*, *Ruddiman*, *Harris*, *Horne-Tooke*, and *Dr Gregory* of Edinburgh. Discoveries in grammar are not indeed to be looked for. They are nearly allied to those in metaphysics; of which, it has been well observed by one of the acutest writers of the age, that the very appearance should be rejected as an error, if not as an imposition, upon mankind.

Longitude at Sea or Land. John Robiſon, M. A. ſecretary to the Royal Society of Edinburgh, and profeſſor of natural philoſophy in the Univerſity, did the Editor the honour of contributing to the Encyclopædia Britannica the valuable articles PHYSICS, PNEUMATICS, PRECESSION *of the Equinoxes*, PROJECTILES, PUMPS, RESISTANCE *of Fluids*, RIVER, ROOF, ROPE-*Making*, ROTATION, SEAMANSHIP, SIGNALS, SOUND, SPECIFIC GRAVITY, STATICS, STEAM and STEAM *Engine*, STRENGTH *of Materials*, TELESCOPE, TIDE, *Articulating* TRUMPET, VARIATION *of the Compaſs*, and *Water*-WORKS. PHILOSOPHY is the joint production of Profeſſor Robiſon and Dr Gleig. PHYSIOLOGY was furniſhed by John Barclay, M. D. of Edinburgh, whoſe merits, if the Editor be not partial to his friend, it will raiſe high in the eſtimation of men of ſcience. The eſſays on PREDESTINATION and PROVIDENCE were contributed by Robert Forſyth, Eſq. advocate ; the account of the *French* REVOLUTION by Mr. Forſyth and Dr Gleig ; and OXYGEN and PHLOGISTON by John Rotheram, M. D. profeſſor of natural philoſophy in the Univerſity of St Andrew's.

The other contributors to the firſt part of the Work we cannot enumerate ; but we know that much uſeful information was occaſionally communicated by Dr Latham of Dartford in Kent, the celebrated ornithologiſt ; by Dr William Wright Phyſician-general to the forces in the Weſt Indies under the command of Sir Ralph Abercrombie ; by the Reverend J. Hawkins, vicar of Halſted in Eſſex ; by the late Mr Adams, mathematical inſtrument-maker to his Majeſty ; and by Mr William Jones, optician in Holborn, London. There is, however, no man to whom the Proprietors of the Encyclopædia Britannica feel themſelves under greater obligations than to Dr Black, for the very handſome offer which he made to the perſon who was at firſt entruſted with the chemical department of the Work. And while they expreſs thus publicly their gratitude to him, may not the Editor declare how much he is indebted to his two aſſiſtants, the Reverend James Walker, M. A. of St John's College, Cambridge, and Mr James Thomſon of Crieff, preacher in the church of Scotland ? Of theſe gentlemen, who ſucceſſively had the care of the Work when he was neceſſarily abſent, he could always ſay, *Quibus in rebus ipſi intereſſe non poſſumus, in his, operæ noſtræ vicaria fides amicorum ſupponitur.*

TO the above preface of the European Editors the publiſher of the American Edition begs leave to add, that neither care nor expenſe have been ſpared to render the work worthy of the Public attention. Some articles have been written anew, ſeveral of original matter have been inſerted, and many have been reviſed and important improvements made in them, indeed, through every volume uſeful though minute improvements have been introduced which contributed to the excellence of the work. The engravings, the paper, and the general execution of the work muſt ſpeak for themſelves, on this ſcore the publiſher thinks he has not much cenſure to fear ; for typographical inaccuracies, which are comparatively few, he has no apology to offer, but flatters himſelf that in a work of ſuch variety and extent the candid reader will view them with indulgence.

FROM the nature of the work many things muſt be expected to be imperfect, and ſome through inadvertence omitted, theſe, with a variety of original materials are propoſed to be taken up in a ſupplementary volume.

ENCYCLOPÆDIA.

A.

A THE first letter of the alphabet, in all the known languages of the world, that of Ethiopia excepted, in which it is the 13th. It has deservedly the first place in the alphabet on account of its simplicity, very little more being necessary to its pronunciation than opening the mouth.

In the English language A is the mark of three different sounds, termed, by our grammarians the *broad*, the *open*, and the *slender* A. The first resembles that of the German A, is found in several monosyllables, as *wall*, *salt*, &c. and is pronounced as *au* in *cause*. It is probable that the Saxons expressed only this broad sound of the letter, as it is still commonly retained in the northern districts of England, and universally throughout Scotland; as *tauk* for *talk*, *wauk* for *walk* or *wake*. The open A resembles that of the Italians in *adagio*, and is the same with that of *a* in *father*, *rather*, &c. The slender sound is peculiar to the English language, and resembles the sound of the French diphthong *ai* in *pais*, or their *a* masculine, or perhaps it is a middle sound between them: it is exemplified in *place*, *waste*, &c. also in *toleration*, *justification*, and all other words ending with *ation*.

A is sometimes added after words in burlesque poetry; in which case it only makes an additional syllable without any alteration of the sense, as the interjection O very often does in our ballads. It is also sometimes redundant, as in the words *arise*, *awake*, &c. which are not different in signification from *rise*, *wake*, &c.

It is sometimes a word, either noun or interjection; in which last case it is commonly an expression of grief, and joined with the aspirate, as *ah!* When a noun, it is only with respect to itself; as *great* A, *little* a, &c.

A is very frequently used as an article; in which case it has no plural signification, and is used to denote the number *one*, as *a* house, *a* field, &c. When placed as an article before any of the vowels, *y* and *w* only excepted, it is joined with the letter *n*; as, *an* island, *an* orator, &c. In the three following cases it is a preposition. 1. When it goes before a participle, or noun derived from a participle; as, I am *a* doing this or that. 2. When used before local surnames, as Cornelius *a* Lapide, Thomas *a* Kempis, &c. 3. When it is used in composition; as, *a* foot, *a* sleep, &c. In some instances it denotes the proportion of one thing to another; as so much *a* week, *a* man, *a* head, &c.

A, among the ancients, was a numeral letter, and signified 500; and when a dash was added on the top, $\bar{\text{A}}$, 5000.

A, in the Julian calendar, is the first of the seven DOMINICAL letters. It had been in use amongst the Romans long before the establishment of Christianity, as the first of the eight *nundinales literæ*; in imitation whereof it was that the dominical letters were first introduced.

A is also an abbreviation used with different intentions. Hence,

A, among logicians, is used to denote an universal affirmative proposition; according to the verse,

Asserit A, negat E, verùm generaliter ambæ.

Thus, in the first figure, a syllogism consisting of three universal affirmative propositions, is said to be in Bār-bā-rā; the *A* thrice repeated, denoting so many of the propositions to be universal, &c. See BARBARA.

A, among the Romans, was used in the giving of votes or suffrages. When a new law was proposed, each voter had two wooden ballots put in his hand; the one marked with a capital *A*, signifying *antiquo*, q. d. *antiquam volo*; and the other with *V. R.* for *uti rogas*. Such as were against the law, cast the first into the urn; as who should say, I refuse it, I antiquate it; or, I like the ancient law, and desire no innovation.

A, in the trials of criminal causes, also denoted absolution; whence Cicero, *pro Milone*, calls *A*, *litera salutaris*, a saving letter. Three ballots were distributed to each judge, marked with the letters, *A* for *absolvo*, I acquit; *C* for *condemno*, I condemn; and *N. L.* for *non liquet*, It is not clear. From the number of each cast into the urn, the prætor pronounced the prisoner's fate. If they were equal in number, he was absolved.

A, in the ancient inscriptions of marbles, &c. occasionally stands for *Augustus*, *ager*, *aiunt*, &c. When double it denotes *Augusti*; when triple, *aurum*, *argentum*, *æs*; and sometimes its meaning can only be known by the rest of the inscription. Isidore adds, that when it occurs after the word *miles* (soldier), it denotes him young. On the reverse of ancient medals, it denotes them struck by the city of Argos, sometimes by that of Athens; but on coins of modern date, it is the mark of Paris.

A, as an abbreviation, is also often found in modern writers: as, A. D. for *anno Domini*: A. M. *artium magister*, master of arts, &c.

A, the letter a, with a line above it thus, ā, is used in in medical prescriptions for *ana*, of each; sometimes it is written thus, āā: e. g. ℞ Mel. Sacchar. & Mann. ā, vel āā, ℥j. i. e. Take of honey, sugar, and manna, of each one ounce.

A, put to bills of exchange, is in England an abbreviation for *accepted*, and in France for *accepté*. It is likewise usual among merchants to mark their sets of books with the letters A, B, C, &c. instead of the numbers 1, 2, 3, &c.

A. A. A. The chemical abbreviation for Amalgama, or Amalgamation,

AA, the name of several rivers in Germany and Swisserland.

AACH, a little town in Germany, in the circle of Suabia, near the source of the river Aach, and almost equally distant from the Danube and the lake Constance. It belongs to the house of Austria. E. Long. 9. 0. Lat. 47. 55.

AAHUS, a little town in Germany, in the circle of Westphalia, and bishopric of Munster. It is the capital of Aahus, a small district; has a good castle; and lies north-east of Coesfeldt. E. Long. 7. 1. Lat. 52. 10.

AAM, or HAAM, a liquid measure in common use among the Dutch, and containing 128 measures called *mingles*, each weighing nearly 36 ounces avoirdupoise; whence the *Aam* contains 218 English, and 148⅓ pints Paris measure.

AAR, the name of two rivers, one in Swisserland, and another in Westpalia in Germany. It is also the name of a small island in the Baltic.

AARASUS (anc. geog.), a town of Pisidia, in the Hither Asia, thought to be the Anassus of Ptolemy.

AARON, high-priest of the Jews, and brother to Moses, was by the father's side great grandson, and by the mother's grandson, of Levi. By God's command he met Moses at the foot of mount Horeb, and they went together into Egypt to deliver the children of Israel: he had a great share in all that Moses did for their deliverance; the scriptures call him the prophet of Moses, and he acted in that capacity after the Israelites had passed over the Red Sea. He ascended mount Sinai with two of his sons, Nadab and Abihu, and seventy elders of the people; but neither he nor they went higher than half way, from whence they saw the glory of God; only Moses and Joshua went to the top, where they staid forty days. During their absence, Aaron, overcome by the people's eager entreaties, set up the golden calf, which the Israelites worshipped by his consent. This calf has given rise to various conjectures. Some rabbies maintain that he did not make the golden calf; but only threw the gold into the fire, to get rid of the importunities of the people; and that certain magicians, who mingled with the Israelites at their departure from Eygpt, cast this gold into the figure of a calf. According to some authors, the fear of a falling a sacrifice to the resentment of the people by giving a refusal, made Aaron comply with their desire; and they alledge also, that he hoped to elude their request, by demanding of the women to contribute their ear-rings, imagining they would rather choose to remain without a visible deity, than be deprived of their personal ornaments. This affair of the golden calf happened in the third month after the Israelites came out of Egypt. In the first month of the following year, Aaron was appointed by God high-priest; which office he executed during the time that the children of Israel continued in the wilderness. He died in the fortieth year after their departure from Egypt, upon mount Hor, being then 123 years old; A. M. 2522, of the Julian period 3262, before the Christian æra 1452. With regard to the attempts of the Egyptian magicians to imitate the miracles performed by his rod, see some remarks under the article MAGICIAN.

AARON and JULIUS (Saints) suffered martyrdom together, during the persecution under the emperor Dioclesian, in the year 303, about the same time with St Alban, the protomartyr of Britain. We are no where told what their British names were, it being usual with the Christian Britons, at the time of baptism, to take new names from the Greek, Latin, or Hebrew. Nor have we any certainty as to the particulars of their death; only that they suffered the most cruel torments. They had each a church erected to his memory; and their festival is placed, in the Roman martyrology, on the first of July.

AARON, or *Harun*, *Al Raschid*, a celebrated khalif, or Mahometan sovereign of the Saracen empire; whose history is given under the article of BAGDAD.

AARON Harischon, a learned rabbi and CARAITE in the 15th century, wrote an Hebrew grammar, printed at Constantinople in 1581; probably the same with Aaron the caraite, who wrote a commentary on the five books of Moses, which is in MS. in the French king's library.

AARSENS (FRANCIS), Lord of Someldyck and Spyck, was one of the greatest ministers for negociation the United Provinces could ever boast of. His father, Cornelius Aarsens, was Register to the States; and being acquainted with Mr Plessis Mornay, at the Court of William Prince of Orange, he prevailed upon him to take his son under him, with whom he continued some years. John Olden Barnevelt, who presided over the affairs of Holland and all the United Provinces, sent him afterwards agent into France, where he learned to negociate under those profound politicians Henry IV. Villeroy, Silleri, Rossie, Jaonnin, &c. and he acquitted himself in such a manner as to obtain their approbation. Soon after, he was invested with the character of ambassador, being the first who was recognised as such by the French court; at which time Henry IV. declared, that he should take precedence next to the Venetian minister. He resided in France 15 years; during which time he received great marks of esteem from the king, who created him a knight and baron; and for this reason he was received amongst the nobles of the province of Holland. However, he became at length so odious to the French court, that they desired to have him recalled. He was afterwards deputed to Venice, and to several German and Italian princes, upon occasion of the troubles in Bohemia. He was the first of three extraordinary ambassadors sent into England in 1620, and the second in 1641; in which latter embassy he was accompanied by the Lord of Brederode as first ambassador, and Heemsvliet as third, to treat about the marriage of Prince William, son to the Prince of Orange. He was likewise ambassador-extraordinary to the French court in 1624, and the Cardinal de Richlieu having just

just taken the administration of affairs into his hands, and knowing he was an able man, made use of him to serve his own purposes. He died in a very advanced age; and his son who survived him, was reputed the wealthiest man in Holland.

Aarsens (Peter), a painter, called in Italy Pietro Longo, because of his stature, was born at Amsterdam 1519. He was eminent for all kinds of subjects; but was particularly famous for altar-pieces, and for representing a kitchen with its furniture: he had the pain to see a fine altar-piece of his destroyed by the rabble in the insurrection 1566, though a lady of Alcmaer offered 200 crowns for its redemption.

AARTGEN, or Aertgen, a painter of merit, was the son of a woolcomber, and born at Leyden in 1498. He worked at his father's trade until he had attained the age of eighteen; and then having discovered a genius for designing, he was placed with Cornelius Engelheihtz, under whom he made a considerable progress in painting. He became so distinguished, that the celebrated Francis Floris went to Leyden out of mere curiosity to see him. He found him inhabiting a poor half-ruined hut, and in a very mean style of living: He solicited him to go to Antwerp, promising him wealth and rank suitable to his merit; but Aartgen refused, declaring that he found more sweets in his poverty than others did in their riches. It was a custom with this painter never to work on Mondays, but to devote that day, with his disciples, to the bottle. He used to stroll about the streets in the night, playing on the German flute, and in one of these frolics was drowned in 1564.

AASAR (anc. geog.), a town of Palestine, in the tribe of Judah, situate between Azotus and Ascalon. In Jerome's time it was an hamlet.

AB, the eleventh month of the civil year of the Hebrews, and the fifth of their ecclesiastical year, which begins with the month Nisan. It answers to the moon of July; that is, to part of our month of the same name, and to the beginning of August: it consists of thirty days. The Jews fast on the first of this month, in memory of Aaron's death; and on the ninth, because on that day both the temple of Solomon, and that erected after the captivity, were burnt; the former by the Chaldeans, and the latter by the Romans. The same day is also remarkable among that people for the publication of Adrian's edict, wherein they were forbid to continue in Judea, or even to look back when at a distance from Jerusalem, in order to lament the desolation of that city. The eighteenth of the same month is also a fast among the Jews; because the lamp in the sanctuary was that night extinguished, in the time of Ahaz.

Ab, in the Syriac calendar, is the name of the last summer-month. The first day of this month they called *Suum Miriam*, the fast of the virgin, because the eastern Christians fasted from that day to the fifteenth, which was therefore called *Fathr-Miriam*, the cessation of the fast of the virgin.

ABA (or rather Abau) Hanifah or Hanfah, firnamed Al-Nooma, was the son of Thabet, and born at Coufah in the 80th year of the Hegira. This is the most celebrated doctor of the orthodox Mussulmans, and his sect holds the principal esteem among the four which they indifferently follow. Notwithstanding this, he was not very well esteemed during his life, insomuch that the khalif Almansor caused him to be imprisoned at Bagdad, for having refused to subscribe to the opinion of absolute predestination, which the Mussulmans call Cadha. But afterwards Abou Joseph, who was the sovereign judge or chancellor of the empire under the khalif Hadi, brought his doctrine into such credit, that it became a prevailing opinion, That to be a good Mussulman was to be a Hanifite. He died in the 150th year of the Hegira, in the prison of Bagdad aforesaid: and it was not till 335 years after his death, that Melick Schah, a sultan of the Selgiucidan race, built for him a magnificent monument in the same city, whereto he adjoined a college peculiarly appropriated to such as made a profession of this sect. This was in the 485th year of the Hegira, and Anno Christi 1092. The most eminent successors of this doctor were Ahmed Benali, Al Giassas, and Al Razi who was the master of Nassari; and there is a mosque particularly appropriated to them in the temple of Mecca.

Aba, *Abas*, *Abos*, or *Abus*, (anc. geog.), the name of a mountain of Greater Armenia, situated between the mountains Niphatos and Nibonis. According to Strabo, the Euphrates and Araxes rose from this mountain; the former running eastward, and the latter westward.

Aba. See Abæ.

ABACÆNA (anc. geog.), a town of Media, and another of Cana in the Hither Asia.

ABACÆNUM (anc. geog.), a town of Sicily, whose ruins are supposed to be those lying near Trippi, a citadel on an high and steep Mountain not far from Messina. The inhabitants were called *Abacænini*.

ABACATUAIA, in ichthology, a barbarous name of the zeus vomer. See Zeus.

ABACH, a market town of Germany, in Lower Bavaria, seated on the Danube. It is remarkable for Roman antiquities, and for springs of mineral waters, which are said to be good for various distempers. E. Long. 11. 56. N. Lat. 48. 53.

ABACINARE, or Abbacinare, in writers of the middle age, a species of punishment, consisting in the blinding of the criminal, by holding a hot bason or bowl of metal before his eyes.

ABACK (a sea-term), the situation of the sails when their surfaces are flatted against the masts by the force of the wind. The sails are said to be *taken aback* when they are brought into this situation, either by a sudden change of the wind, or by an alteration in the ship's course. They are *laid aback*, to effect an immediate retreat, without turning to the right or left; or, in the sea phrase, to give the ship *stern-way*, in order to avoid some danger discovered before her in a narrow channel, or when she has advanced beyond her station in the line of battle, or otherwise. The sails are placed in this position by slackening the lee-braces, and hauling in the weather ones; so that the whole effort of the wind is exerted on the forepart of the surface, which readily pushes the ship astern, unless she is restrained by some counteracting force. It is also usual to spread some sail aback near the stern, as the mizzen top-sail, when a ship rides with a single anchor in a road, in order to prevent her from approaching it so as to entangle the flukes of it with her slackened cable, and thereby loosen it from the ground.

ABACOT, the name of an ancient cap of ſtate worn by the kings of England, the upper part whereof was in the form of a double crown.

ABACTORS, or Abactores, a name given to thoſe who drive away, or rather ſteal, cattle by herds, or great numbers at once; and are therefore very properly diſtinguiſhed from *fures*, or thieves.

ABACUS, among the ancients, was a kind of cupboard or buffet. Livy, deſcribing the luxury into which the Romans degenerated after the conqueſt of Aſia, ſays, They had their *abaci*, beds, *&c.* plated over with gold.

Abacus, among the ancient mathematicians, ſignified a table covered with duſt, on which they drew their diagrams; the word in this ſenſe being derived from the Phœnician *abak*, duſt.

Abacus, in architecture, ſignifies the ſuperior part or member of the capital of a column, and ſerves as a kind of crowning to both. Vitruvius tells us the abacus was originally intended to repreſent a ſquare tile laid over an urn, or rather over a baſket. See Architecture, n° 15. The form of the abacus is not the ſame in all orders: in the Tuſcan, Doric, and Ionic, it is generally ſquare; but in the Corinthian and Compoſite, its four ſides are arched inwards, and embelliſhed in the middle with ſome ornament, as a roſe or other flower. Scammozzi uſes *abacus* for a concave moulding on the capital of the Tuſcan pedeſtal; and Palladio calls the plinth above the echinus, or boultin, in the Tuſcan and Doric orders, by the ſame name.

Abacus is alſo the name of an ancient inſtrument for facilitating operations in arithmetic. It is variouſly contrived. That chiefly uſed in Europe is made by drawing any number of parallel lines at the diſtance of two diameters of one of the counters uſed in the calculation. A counter placed on the loweſt line, ſignifies 1; on the 2d, 10; on the 3d, 100; on the 4th, 1000, &c. In the intermediate ſpaces, the ſame counters are eſtimated at one half of the value of the line immediately ſuperior, *viz.* between the 1ſt and 2d, 5; between the 2d and 3d, 50; &c. See the figure on Plate I. where the ſame number, 1788 for example, is repreſented under both diviſions by different diſpoſitions of the counters.

Abacus is alſo uſed by modern writers for a table of numbers ready caſt up, to expedite the operations of arithmetic. In this ſenſe we have *Abaci* of addition, of multiplication, of diviſion.

Chineſe Abacus. See Swanpan.

Abacus Pythagoricus, the common multiplication-table, ſo called from its being invented by Pythagoras.

Abacus Logiſticus, is a rectangled triangle, whoſe ſides, forming the right angle, contain the numbers from 1 to 60; and its area, the facta of each two of the numbers perpendicularly oppoſite. This is alſo called a *canon of ſexageſimals.*

Abacus & Palmulæ, in the ancient muſic, denote the machinery, whereby the ſtrings of Polyplectra, or inſtruments of many ſtrings, were ſtruck with a plectrum made of quills.

Abacus Harmonicus, is uſed by Kircher for the ſtructure and diſpoſition of the keys of a muſical inſtrument, whether to be touched with the hands or the feet.

Abacus Major, in metallurgic operations, the name of a trough uſed in the mines, wherein the ore is waſhed.

ABADDON, is the name which St John in the Revelation gives to the king of the locuſts, the angel of the bottomleſs pit. The inſpired writer ſays, this word is Hebrew, and in Greek ſignifies Ἀπολλυων, *i. e.* a *deſtroyer*. That angel-king is thought to be Satan or the devil: but Mr le Clerc thinks, with Dr. Hammond, that by the locuſts which came out of the abyſs, may be underſtood the zealots and robbers, who miſerably afflicted the land of Judea, and laid it in a manner waſte before Jeruſalem was taken by the Romans; and that Abaddon, the king of the locuſts, may be John of Giſchala, who having treacherouſly left that town a little before it was ſurrendered to Titus, came to Jeruſalem, where he ſoon headed part of the zealots, who acknowledged him as their king, whilſt the reſt would not ſubmit to him. This ſubdiviſion of the zealot party brought a thouſand calamities on the Jews.

ABADIR, a title which the Carthaginians gave to gods of the firſt order. In the Roman mythology, it is the name of a ſtone which Saturn ſwallowed, by the contrivance of his wife Ops, believing it to be his new-born ſon Jupiter: hence it ridiculouſly became the object of religious worſhip.

ABÆ, or Aba (anc. geog.) a town of Phocis in Greece, near Helicon; famous for an oracle of Apollo older than that at Delphi, and for a rich temple plundered and burnt by the Perſians.

ABAFT, a ſea-term, ſignifying the hinder part of a ſhip, or all thoſe parts both within and without which lie towards the ſtern, in oppoſition to afore; which ſee. *Abaft*, is alſo uſed as a prepoſition, and ſignifies *further aft*, or *nearer the ſtern*; as the barricade ſtands *abaft* the main-maſt, *i. e.* behind it, or nearer the ſtern.

ABAISSED, *Abaiſſe*, in heraldry, an epithet applied to the wings of eagles, &c. when the tip looks downwards to the point of the ſhield, or when the wings are ſhut, the natural way of bearing them being extended.

ABAKA khan, the 18th emperor of the Moguls, a wiſe and clement prince. He reigned 17 years, and is by ſome authors ſaid to have been a Chriſtian. It may be admitted, indeed, that he joined with the Chriſtians in keeping the feaſt of Eaſter, in the city Hanadau, ſome ſhort time before his death. But this is no proof of his Chriſtianity; it being common, in times of brotherly love, for Chriſtians and Mahometans to join in keeping the ſame feaſts, when each would compliment the other with doing honour to his ſolemnity.

ABALAK, a town of Siberia, two miles from Tobolſk. E. Long. 64. 10. N. Lat. 57. 1.

ABALIENATION, in law, the act of transferring one man's property to another.

ABALLABA, the ancient name of Appleby, a town in Weſtmoreland, remarkable only for its antiquity, having been a Roman ſtation. W. Long. 1. 4. N. Lat. 55. 38.

ABALUS, (anc. geog.), ſuppoſed by the ancients to be an iſland in the German ocean, called by Timæus *Baſilia*, and by Xenophon Lampſacenus *Baltia*; now the peninſula of Scandinavia. Here, according to Pliny, ſome imagined that amber dropped from the trees.

ABANA, or AMANA (anc. geog.), a river of Phœnicia, which, rising from Mount Hermon, washed the south and west sides of Damascus, and falls into the Phœnician sea to the north of Tripolis, called *Chrysorrheas* by the Greeks.

ABANGA. See ADY.

ABANO, a town of the Paduano, in the republic of Venice, famous among the ancients for its hot baths.

ABANTES, a people who came originally from Thrace, and settled in Phoceca, a country of Greece, where they built a town which they called Aba, after the name of Abas their leader; and, if we may credit some ancient authors, the Abantes went afterwards into the island Euboea, now called Negropont: others say the Abantes of Euboea came from Athens. The Abantes were a very warlike people, closing with their enemies, and fighting hand to hand.

ABANTIAS, or ABANTIS (anc. geog.), a name of the island Euboea in the Egean sea, extending along the coast of Greece, from the promontory Sunium of Attica to Thessaly, and separated from Bœotia by a narrow strait called *Euripus*. From its length the island was formerly called *Macris;* afterwards *Abantias*, or *Abantis*, from the Abantes, a people originally of Thrace, called by Homer οπισθεν Κομοωντες, from wearing their hair long behind, having in a battle experienced the inconvenience of wearing long hair before. From cutting their hair before, they were called *Curetes*.

ABAPTISTON, in surgery, the perforating part of the instrument called a TREPAN.

ABARA, a town in the Greater Armenia, under the dominion of the Turks: it is often the residence of the archbishop of Naksivan. E. Long. 46. 25. N. Lat. 39. 45.

ABARANER, a town of Asia, in Grand Armenia, belonging to the Turks: it is seated on the river Alingena. E. Long. 46. 30. N. Lat. 39. 50.

ABARCA, an ancient kind of shoe used in Spain for passing the mountains with. It was made of raw hides, and bound with cords, which secured the feet of travellers against the snow.

ABARIM, high mountains of steep ascent, separating the country of the Ammonites and Moabites from the land of Canaan, where Moses died. According to Josephus, they stood opposite to the territory of Jericho, and were the last station but one of the Israelites coming from Egypt. Nebah and Pisgah were parts of these mountains.

ABARIS, the Hyperborean; a celebrated sage of antiquity, whose history and travels have been the subject of much learned discussion. Such a number of fabulous stories* were told of him, that Herodotus himself seems to scruple to relate them. He tells us only,† that this Barbarian was said to have travelled with an arrow, and to have taken no sustenance: but this does not acquaint us with the marvellous properties which were attributed to that arrow; nor that it had been given him by the Hyperborean Apollo. With regard to the occasion of his leaving his native country, Harpocration‡ tells us, that the whole earth being infested with a deadly plague, Apollo, upon being consulted, gave no other answer, than that the Athenians should offer up prayers in behalf of all other nations: upon which several countries deputed ambassadors to Athens,

* Jamblichi *Vita Pythag*

† Lib. iv. cap. 36.

‡ Under the word Ἀβαρις.

among whom was Abaris the Hyperborean. In this journey he renewed the alliance between his countrymen and the inhabitants of the island of Delos. It appears that he also went to Lacedæmon; since, according to some writers§, he there built a temple, consecrated to Proserpine the Salutary. It is asserted, that he was capable of foretelling earthquakes, driving away plagues, laying storms‡, &c. He wrote several books, as Suidas † informs us, *viz.* Apollo's arrival into the country of the Hyperboreans; The nuptials of the river Hebrus; Θεογονια, or the Generation of the Gods; A collection of oracles; &c. Himerius the sophist applauds him for speaking pure Greek; which attainment will be no matter of wonder to such as consider the ancient intercourse there was between the Greeks and Hyperboreans. If the Hebrides, or Western Island of Scotland (says Mr Tolland*), were the Hyperboreans of Diodorus†, then the celebrated Abaris was of that country; and likewise a druid, having been the priest of Apollo. Suidas, who knew not the distinction of the insular Hyperboreans, makes him a Scythian; as do some others, misled by the same vulgar error; though Diodorus has truly fixed his country in an island, and not on the continent. Indeed, the fictions and mistakes concerning our Abaris are infinite: however, it is by all agreed that he travelled quite over Greece, and from thence into Italy, where he conversed familiarly with Pythagoras, who favoured him beyond all his disciples, by instructing him in his doctrines (especially his thoughts of nature), in a plainer and more compendious method than he did any other. This distinction could not but be very advantageous to Abaris. The Hyperborean, in return, presented the Samian, as though he equalled Apollo himself in wisdom, with the sacred arrow, on which the Greeks have fabulously related ‡ that he sat astride, and flew upon it, through the air, over rivers and lakes, forests and mountains; in like manner as the vulgar still believe, particularly those of the Hebrides, that wizards and witches fly whithersoever they please on their broom sticks. The orator Himerius abovementioned, though one of those who, from the equivocal sense of the word Hyperborean, seems to have mistaken Abaris for a Scythian, yet describes his person accurately, and gives him a very noble character. "They relate (says he) "that Abaris the sage was by nation a Hyperborean, "appeared a Grecian in speech, and resembled a Scy-"thian in his habit and appearance. He came to "Athens, holding a bow in his hand, having a quiver "hanging on his shoulders, his body wrapt up in a "plaid, girt about the loins with a gilded belt, and "wearing trowsers reaching from his waist downward." By this it is evident (continues Mr Toland) that he was not habited like the Scythians, who were always covered with skins; but appeared in the native garb of an aboriginal Scot. As to what relates to his abilities, Himerius informs us, that "he was affable and "pleasant in conversation, in dispatching great affairs "secret and industrious, quick-sighted in present exi-"gencies, in preventing future dangers circumspect, "a searcher after wisdom, desirous of friendship, trust-"ing little to fortune, and having every thing trusted "to him for his prudence." Neither the Academy nor the Lycæum could have furnished a man with fitter qualities to travel so far abroad, and to such wise nations,

§ Pausanias lib. iii. p. 94.

‡ Porphyry in *Vita Pythagor.*

† Under the word Ἀβαρις.

* Account of the Druids, in his *Posthumous Works*, vol. i. p. 161.

† Diod. Sic. lib. ii, iii.

‡ Jamblichi *Vita Pytha.* p. 128.

nations, about affairs no less arduous than important. And if we further attentively consider his moderation in eating, drinking, and the use of all those things which our natural appetites incessantly crave; joining the candour and simplicity of his manners with the solidity and wisdom of his answers, all which we find sufficiently attested: it must be owned, that the world at that time had few to compare with Abaris.

ABARTICULATION, in anatomy, a species of articulation admitting of a manifest motion; called also Diarthrosis, and Dearticulatio, to distinguish it from that sort of articulation which admits of a very obscure motion, and is called Synarthrosis.

ABAS, a weight used in Persia for weighing pearls. It is one-eighth less than the European carat.

Abas, in the heathen mythology, was the son of Hypothoon and Meganira, who entertained Ceres, and offered a sacrifice to that goddess; but Abas ridiculing the ceremony, and giving her opprobrious language, she sprinkled him with a certain mixture she held in her cup, on which he became a newt or water lizard.

Abas (Schah) the Great, was third son of Codabendi, 7th king of Persia, of the race of the Sophis. Succeeding to his father at 18, in 1585, he found the affairs of Persia at a low ebb, occasioned by the conquests of the Turks and Tartars. He regained several of the provinces they had seized; but death put a stop to his victories in 1629, after a reign of 44 years. He was the greatest prince that had reigned in Persia for many ages; and it was he who made Ispahan the metropolis of Persia: his memory is held in the highest veneration among the Persians.

Abas (Schah) his grandson, 9th king of Persia, of the race of the Sophis, succeeded his father Sesi at 13 years of age: he was but 18 when he made himself master of the city Candahar, which had surrendered in his father's reign to the Great Mogul, and all the province about it; and he preserved it afterwards against this Indian emperor, though he besieged it more than once with an army of 300,000 men. He was a very merciful prince, and openly protected the Christians; he had formed a design of extending the limits of his kingdom towards the north, and had for that effect levied a powerful army; but death put a stop to all his great designs at 37 years of age, in 1666.

ABASCIA, or Abcas, a country in Asia, tributary to the Turks, situated on the coast of the Black Sea. The people are poor, thievish, and treacherous, insomuch that there is no trading with them without the utmost caution. Their commodities are furs, buck and tyger skins, linen yarn, boxwood, and bees-wax: but their greatest traffic is in selling their own children, and even one another, to the Turks; insomuch that they live in perpetual distrust. They are destitute of many necessaries of life, and have nothing among them that can be called a town; though we find Anacopia, Dundar, and Czekorni, mentioned in the maps. They have the name of Christians; but having nothing left but the name, any more than the Mingrelians their northern neighbours. The men are robust and active, and the the women are fair and beautiful; on which account the Turks have a great value for the female slaves which they purchase from among them. Their customs are much the same as those of the Mingrelians; which see. E. Long. from 39 to 43. N. Lat. from 43 to 45.

ABASCUS, a river of Asiatic Sarmatia, which, rising from Mount Caucasus, falls into the Euxine, between Pityus to the east, and Nosis to the west.

ABASITIS (anc. geog.), a tract of Asiatic Mysia, in which was situated the city of Ancyra.

ABASSI, or Absasis, a silver coin current in Persia, equivalent in value to a French livre, or tenpence halfpenny Sterling. It took its name from Schah Abbas II. king of Persia, under whom it was struck.

ABASSUS (anc. geog.), a town of the Greater Phrygia, on the confines of the Tolistobagii, a people of Galatia in Asia.

ABATAMENTUM, in law, is an entry to lands by interposition, *i. e.* when a person dies seized, and another who has no right enters before the heir.

To ABATE, (from the French *abbatre*, to pull down, overthrow, demolish, batter down, or destroy), a term used by the writers of the English common-law, both in the active and neutral sense; as, To abate a castle, is to beat it down. To abate a writ, is, by some exception, to defeat or overthrow it. A stranger abateth; that is, entereth upon a house or land void by the death of him that last possessed it, before the heir takes possession, and so keepeth him out: wherefore, as he that putteth out him in possession is said to disseize, so he that steppeth in between the former possessor and his heir is said to abate. In the neuter signification thus: The writ of the demandant shall abate; that is, shall be disabled, frustrated or overthrown. The appeal abateth by covin; that is, the accusation is defeated by deceit.

Abate, in the manege, implies the performing any downward motion properly. Thus a horse is said to abate to take down his curvets, when he puts both his hind legs to the ground at once, and observes the same exactness in all the times.

ABATELEMENT, in commerce, a term used for a prohibition of trade to all French merchants in the ports of the Levant who will not stand to their bargains, or refuse to pay their debts. It is a sentence of the French consul, which must be taken off before they can sue any person for the payment of their debts.

ABATEMENT, in heraldry, an accidental figure supposed to have been added to coats of arms, in order to denote some dishonourable demeanour or stain, whereby the dignity of coat-armour was rendered of less esteem. See Heraldry.

Abatement, in law. See *To* Abate.

Abatement, in the customs, an allowance made upon the duty of goods, when the quantum damaged is determined by the judgment of two merchants upon oath, and ascertained by a certificate from the surveyor and land-waiter.

ABATIS, an ancient term for an officer of the stables.

ABATON, an erection at Rhodes, as a fence to the trophy of Artemisia, queen of Halicarnassus, Coos, &c. raised in memory of her victory over the Rhodians; or rather as a screen to conceal the disgrace of the Rhodians from the eyes of the world, the effacing or destroying the trophy being with them a point of religion.

ABATOR, in law, a term applied to a person who enters to a house or lands void by the death of the last possessor, before the true heir.

ABATOS (anc. geog.), an island in the lake Moeris, formerly famous for its papyrus. It was the burial-place of Osiris.

ABAVO, in botany a synonime of the ADANSONIA.

ABB, a term; among clothiers, applied to the yarn of a weaver's warp. They say also *Abb-wool* in the same sense.

ABBA (anc. geog.) a town of Afric Propria, near Carthage.

ABBA, in the Syriac and Chaldee languages, literally signifies *a father;* and, figuratively, a superior, reputed as a father in respect of age, dignity, or affection. It is more particularly used in the Syriac, Coptic, and Ethiopic churches, as a title given to the bishops. The bishops themselves bestow the title *Abba* more eminently on the bishop of Alexandria; which occasioned the people to give him the title of *Baba*, or *Papa*, that is, *Grandfather;* a title which he bore before the bishop of Rome. It is a Jewish title of honour given to certain rabbins called *Tanaites;* and it is also particularly used, by some writers of the middle age, for the superior of a monastery, usually called ABBOT.

ABBADIE (James), an eminent Protestant divine, born at Nay in Bern in 1654; first educated there under the famous John la Placette, and afterward at the university of Sedan. From thence he went into Holland and Germany, and was minister in the French church of Berlin. He left that place in 1690; came into England; was sometime minister in the French church in the Savoy, London; and was made dean of Killalow in Ireland. He died at St Mary le Bonne near London, in 1727, aged 73. He was strongly attached to the cause of king William, as appears in his elaborate defence of the revolution, and his history of the assassination-plot. He had great natural abilities, which he improved by true and useful learning. He was a most zealous defender of the primitive doctrine of the Protestants, as appears by his writings; and that strong nervous eloquence, for which he was so remarkable, enabling him to enforce the doctrines of his profession, from the pulpit with great spirit and energy. He published several works in French that were much esteemed; the principal of which are, A Treatise on the Truth of the Christian Religion; The art of Knowing one's Self; A Defence of the British Nation; The Deity of Jesus Christ essential to the Christian Religion; The History of the last conspiracy in England, written by order of king William III.; and The Triumph of Providence and Religion, or the opening the Seven Seals by the Son of God.

ABBAS, son of Abdalmothleb, and Mahomet's uncle, opposed his nephew with all his power, esteeming him an impostor and infidel; but in the second year of the Hegira, being overcome and made a prisoner at the battle of Bendir in 623, a great ransom being demanded for him, he represented to Mahomet, that his paying it would reduce him to poverty, which would redound to the dishonour of the family. But Mahomet having been informed of Abbas's having secreted large sums of money, asked him after the purses of gold he had left in his mother's custody at Mecca. Abbas, upon this, conceiving him to be really a prophet, embraced his new religion; became one of his principal captains; and saved his life when in eminent danger at the battle of Henain, against the Thakesites, soon after the reduction of Mecca. But besides being a great

commander, Abbas was a famous doctor of the Mussulman law, insomuch that he read lectures upon every chapter of the Koran, as his nephew pretended to receive them one by one from heaven. He died in 652, and his memory is held in the highest veneration among the Mussulmans to this day.

Abul ABBAS surnamed *Saffah*, was proclaimed khalif; and in him began the Dynasty of the

ABBASSIDES, who possessed the khalifate for 524 years; and there were 37 khalifs of this race who succeeded one another without interruption.

ABBE, in a monastic sense, the same with ABBOT.

ABBE, in a modern sense, is the name of a curious popular character in France, very much mentioned, but very little known, in Britain. The term is not to be rendered in our language, as the existence of the being which it denominates is posterior to the reformation, and no such character was known among the Romanists till about a century and a half ago.

Abbés, according to the strictest definition, are persons who have not yet obtained any precise or fixed settlement in church or state, but most heartily wish for and would accept of either, just as it may happen. In the mean while, their privileges are many. They are admissible in all companies, and no degradation to the best, notwithstanding they are sometimes found in the worst. Their dress is rather that of an academic, or of a professed scholar, than of an ecclesiastic; and, never varying in colour, is no incumbrance on the pocket.

These abbés are very numerous, and no less useful. They are, in colleges, the instructors of youth; in private families, the tutors of young gentlemen; and many procure a decent livelihood by their literary and witty compositions of all kinds, from the profoundest philosophy to the most airy romances. They are, in short, a body of men who possess a fund of universal talents and learning, and are incessantly employed in the cultivation of every various branch of literature and ingenuity. No subject whatever escapes them; serious or gay, solid or ludicrous, sacred or profane, all pay tribute to their researches; and as they are conversant in the lowest as well as the highest topics, their fame is equally great in the learned and in the scribbling world.

A distinguishing part of their character, too, though we shall but slightly touch it, is their devotion to the fair sex: whose favourites, in return, they have the honour of being in the most enviable degree; the wit and smartness for which they are usually remarkable, being just the very things that suit the French ladies.—In fine, these abbés are sought after by most people, on various accounts; as they are equally men of business and pleasure, not less expert in the most serious transactions, than fond of enjoying their share in whatever occupies the gay world. Hence they diligently frequent all public spectacles, which are thought incomplete without them; as they compose the most intelligent part of the company, and are the most weighty approvers or condemners of what passes in almost all places.

ABBESS, the superior of an abbey or convent of nuns. The abbess has the same rights and authority over her nuns that the abbots regular have over their monks. The sex indeed does not allow her to perform the spiritual functions annexed to the priesthood, wherewith the abbots is usually invested; but there are instances of some abbesses who have a right or rather a privilege, to commission a priest to act for them. They have even a kind of episcopal jurisdiction, as well as some abbots who are exempted from the visitation of their diocesans.

Martene, in his treatise on the rights of the Church, observes, that some abbesses have formerly confessed their nuns. But he adds, that their excessive curiosity carried them such lengths, that there arose a necessity of checking it. However, St Basil, in his Rule, allows the abbess to be present with the priest at the confession of her nuns.

ABBEVILLE, a considerable city of France in Picardy, and the capital of Ponthieu; the river Somme runs through the middle of it, and divides it into two parts. It has a collegiate church and twelve parish-churches; the most considerable of which are St George's and St Giles's, besides a great number of monasteries and nunneries, a bailiwic, and a presidial court. It is a fortified town; the walls are flanked with bastions, and surrounded by large ditches; and was never yet taken; from which circumstance it is sometimes called the *Maiden Town*. The country about it is low, marshy, and dirty. It is pretty well peopled, and is famous for its woollen manufactory. The cloths and stuffs made there are said to be now little inferior to those of England and Holland. The work, however, is assisted by the clandestine importation of English and Irish wool, and workmen from Great Britain. It is about fifteen miles east of the British channel, and ships may come from thence by the river Somme to the middle of the town. E. Long. 2. 6. Lat. 50. 7.

ABBEY, a monastery, or religious house, governed by a superior under the title of *abbot* or *abbess*.

Abbeys differ from *priories*, in that the former are under the direction of an abbot, and the others of a prior: but abbot and prior (we mean a prior conventual) are much the same thing, differing in little but the name.

Fauchet observes, that in the early days of the French monarchy, dukes and counts were called *abbots*, and duchies and counties *abbeys*. Even some of their kings are mentioned in history under the title of *abbots*. Philip I. Louis VI. and afterwards the dukes of Orleans, are called *abbots of the monastery of St Aignan*. The dukes of Aquitain were called *abbots of the monastery of St Hilary, at Poictiers*; and the earls of Anjou, of *St Aubin*, &c.

Monasteries were at first nothing more than religious houses, whither persons retired from the bustle of the world to spend their time in solitude and devotion. But they soon degenerated from their original institution, and procured large privileges, exemptions, and riches. They prevailed greatly in Britain before the reformation; particularly in England: and as they increased in riches, so the state became poor; for the lands, which these regulars possessed were *in mortua manu*, i. e. could never revert to the lords who gave them. This inconvenience gave rise to the statutes against gifts in *mortmaine*, which prohibited donations to these religious houses: and Lord Coke tells us, that several lords, at their creation, had a clause in their grant, that the donor might give or sell his land to whom he would (*exceptis viris religiosis & Judæis*) excepting monks and Jews.

The places were wholly abolished in England at the time of the Reformation; Henry VIII. having first appointed visitors to inspect into the lives of the monks and nuns, which were found in some places very disorderly: upon which, the abbots, perceiving their dissolution unavoidable, were induced to resign their houses to the king, who by that means became invested with the abbey-lands: these were afterwards granted to different persons, whose descendents enjoy them at this day: they were then valued at 2,853,000*l.* per annum, an immense sum in those days.

Though the suppression of religious houses, even considered in a political light only, was of a very great national benefit, it must be owned, that, at the time they flourished, they were not entirely useless. Abbeys or monasteries were then the repositories, as well as the seminaries, of learning; many valuable books and national records, as well as private evidences, have been preserved in their libraries; the only places wherein they could have been safely lodged in those turbulent times. Many of those, which had escaped the ravages of the Danes, were destroyed with more than Gothic barbarity at the dissolution of the abbeys. These ravages are pathetically lamented by John Bale, in his Declaration upon Leland's Journal 1549. "Covetousness," says he, "was at that time so busy about private commodity, that public wealth, in that most necessary and of respect, was not any where regarded. A number of them which purchased these superstitious mansions, reserved of the library-books, some to serve their jacks, some to scour the candlesticks, and some to rub their boots; some they sold to the grocer and soap-seller; and some they sent over sea to the book-binders, not in small numbers, but in whole ships full; yea, the universities of this realm are not clear of so detestable a fact. I know a merchant that bought the contents of two noble libraries for 40s. price; a shame it is to be spoken! This stuff hath he occupied instead of gray paper, by the space of more than these ten years, and yet he hath store enough for as many years to come. I shall judge this to be true, and utter it with heaviness, that neither the Britons under the Romans and Saxons, nor yet the English people under the Danes and Normans, had ever such damage of their learned monuments as we have seen in our time."

In these days every abbey had at least one person whose office it was to instruct youth; and the historians of this country are chiefly beholden to the monks for the knowledge they have of former national events. In these houses also the arts of painting, architecture, and printing, were cultivated. The religious houses also were hospitals for the sick and poor; affording likewise entertainment to travellers at a time when there were no inns. In them the nobility and gentry who were heirs to their founders could provide for a certain number of ancient and faithful servants, by procuring them corodies, or stated allowances of meal, drink, and clothes. They were likewise an asylum for aged and indigent persons of good family. The neighbouring places were also greatly benefited by the fairs procured for them, and by their exemption from forest-laws; add to which, that the monastic estates were generally let at very easy rents, the fines given at renewals included.

ABBEYBOYLE, a town of Ireland, in the county of Roscommon, and province of Connaught. W. Long. 8. 32. N. Lat. 56. 44. It is remarkable for an old abbey.

Abbeyholm, Abbot.

ABBEYHOLM, a town in Cumberland, so called from an abbey built there by David king of Scots. It stands on an arm of the sea. W. Long. 2. 38. Lat. 54. 45.

ABBOT, or ABBAT, the superior of a monastery of monks erected into an abbey or prelacy.

The name *Abbot* is originally Hebrew, where it signifies father. The Jews call *father*, in their language, *Ab*; whence the Chaldeans and Syrians formed *Abba*, thence the Greeks Αββας, which the Latins retained, *Abbas*; and hence our *Abbot*, the French *Abbé*, &c. —St Mark and St Paul use the Syriac *Abba* in their Greek, by reason it was then commonly known in the synagogues and the primitive assemblies of the Christians: adding to it, by way of interpretation, the word *father*, Αββα ο πατηρ, "Abba, father;" *q. d.* Abba, that is to say, Father.—But the name Ab, or Abba, which was at first a term of tenderness and affection in the Hebrew and Chaldee, became at length a title of dignity and honour: The Jewish doctors affected it; and one of their most ancient books, containing the sayings or apophthegms of divers of them, is intitled Pirke *Abboth*, or Avoth; *i. e.* Chapters of the Fathers. It was in allusion to this affectation, that Jesus Christ forbad his disciples to call any man their father on earth; which word St Jerome turns against the superiors of the monasteries of his time, for assuming the title of *Abbots*, or Fathers.

The name *Abbot*, then, appears as old as the institution of monks itself.—The governors of the primitive monasteries assumed indifferently the titles *Abbots*, and *Archimandrites**. They were really distinguished from the clergy; though frequently confounded with them, because a degree above laymen.

* See *Monk* and *Archimandrite*.

In those early days, the abbots were subject to the bishops and the ordinary pastors. Their monasteries being remote from cities, built in the farthest solitudes, they had no share in ecclesiastical affairs. They went on Sundays to the parish-church with the rest of the people; or, if they were too remote, a priest was sent them to administer the sacraments; till at length they were allowed to have priests of their own body. The abbot or archimandrite himself was usually the priest: but his function extended no farther than to the spiritual assistance of his monastery; and he remained still in obedience to the bishop. There being among the abbots several persons of learning, they made a vigorous opposition to the rising heresies of those times; which first occasioned the bishops to call them out of their desarts, and fix them about the suburbs of cities, and at length in the cities themselves: from which æra their degeneracy is to be dated. The abbots, now, soon wore off their former plainness and simplicity, and began to be looked on as a sort of little prelates. They aspired at being independent of the bishops; and became so insupportable, that some severe laws were made against them at the council of Chalcedon; this notwithstanding, in time many of them carried the point of independency, and got the appellation of *lord*, with other badges of the episcopate, particularly the mitre.

Hence arose new species of distinctions between the abbots. Those were termed *mitred* abbots, who were privileged to wear the mitre, and exercise episcopal authority within their respective precincts, being exempted from the jurisdiction of the bishop. Others were called *crosiered* abbots, from their bearing the crosier or pastoral staff. Others were styled *œcumenical* or universal abbots, in imitation of the patriach of Constantinople: while others were termed *cardinal* abbots, from their superiority over all other abbots.—In Britain, the mitred abbots were lords of parliament; and called abbots-sovereign, and abbots-general, to distinguish them from the other abbots. And as there were lords abbots, so there were also lords priors who had exempt jurisdiction, and were likewise lords of Parliament. Some reckon 26 of these lords abbots and priors that sat in parliament. Sir Edward Coke says, that there were 27 parliamentary abbots and two priors. In the parliament 20 Rich. II. there were but 25 abbots and two priors: but in the summons to parliament *anno* 4 Ed. III. more are named.

At present, in the Roman-Catholic countries, the principal distinctions observed between the abbots are those of *regular* and *commendatory*. The former take the vow and wear the habit of their order; whereas the latter are seculars, though they are obliged by their bulls to take orders when of proper age.

Anciently the ceremony of creating an abbot consisted in clothing him with the habit called *cuculus*, or cowl; putting the pastoral staff into his hand, and the shoes called *pedales* on his feet; but at present, it is only a simple benediction, improperly called, by some, consecration.

ABBOT is also a title given to others beside the superiors of monasteries: thus bishops, whose sees were formerly abbeys, are called abbots; as are the superiors of some congregations of regular canons, particularly that of St Geneviéve at Paris: and among the Genoese, the chief magistrate of their republic formerly bore the title of Abbot of the people. It was likewise usual, about the time of Charlemagne, for several lords to assume the title of *count-abbots, abba comites*; and that for no other reason, but because the superintendency of certain abbeys was commited to them.

ABBOT (George), archbishop of Canterbury, was born Oct. 29. 1562, at Guildford in Surrey. He went through his studies at Oxford, and in 1597 was chosen principal of University College. In 1599, he was installed dean of Winchester: the year following, he was chosen vice-chancellor of the university of Oxford, and a second time in 1603. In 1604, that translation of the bible now in use was begun by the direction of king James; and Dr. Abbot was the second of eight divines of Oxford, to whom the care of translating the whole New Testament (excepting the epistles) was committed. The year following, he was a third time vice-chancellor. In 1608, he went to Scotland with George Hume Earl of Dunbar, to assist in establishing an union betwixt the kirk of Scotland and the church of England; and in this affair he behaved* with so much address and moderation, that it laid the foundation of all his future preferment. For king James ever after paid great deference to his advice and counsel; and upon the death of Dr. Overton bishop of Litchfield and Coventry, he named Dr. Abbot for his successor, who was accordingly constituted bishop of those two united sees in December 1609. About a month afterwards he was translated to the see of London, and on the second of November thereafter was raised to the archiepiscopal see.

* Heylin's hist. of Presbyterians, p. 83.

Abbot.

It is not however improbable, that his extravagant adulation of his royal master, in which he went as far as any other court chaplain could do, contributed not a little to the acceleration of his preferment. In the preface to a pamphlet he published, the following specimen of ridiculous flattery occurs: Speaking of the king, he says, "whose life hath been so immaculate and unspotted, &c. that even malice itself, which leaves nothing unsearched, could never find true blemish in it, nor cast probable aspersion on it.—Zealous as David; learned and wise, the *Solomon* of our age; religious as Josias; careful of spreading Christ's faith as Constantine the Great; just as Moses; undefiled in all his ways as a Jehosaphat and Hezekias; full of clemency as another Theodosius."—If Mr Walpole had seen this passage, he certainly would not have said, that "honest Abbot could not flatter."

His great zeal for the Protestant Religion made him a strenuous promoter of the match between the Elector Palatine and the Princess Elizabeth; which was accordingly concluded and solemnized the 14th of February 1612, the archbishop performing the ceremony on a stage erected in the royal chapel. In the following year happened the famous case of divorce betwixt the lady Francis Howard, daughter of the earl of Suffolk, and Robert earl of Essex: an affair which has been by many considered as one of the greatest blemishes in king James's reign; but the part therein acted by the archbishop added much to the reputation he had already acquired for incorruptible integrity. The matter was by the king referred to a court of delegates. The archbishop saw plainly, that his Majesty was very desirous the lady should be divorced: but he was, in his own judgment, directly against the divorce. He laboured all he could to extricate himself from this difficulty, by having an end put to the cause by some other way than by sentence: but it was to no purpose: for those who drove on this affair, had got too great power to be restrained from bringing it to the conclusion the king desired. The archbishop prepared a speech, which he intended to have spoken against the nullity of the marriage, in the court at Lambeth; but he did not make use of it, because the king ordered the opinions to be given in few words. He continued, however, inflexible in his opinion against the divorce; and drew up his reasons, which the king thought fit to answer himself. It need scarce be added, that sentence was given in the lady's favour. In 1611, the king published a declaration, which he ordered to be read in all the churches, permitting sports and pastimes on the Lord's day: this gave great uneasiness to the archbishop, who, happening to be at Croydon when it came hither, had the courage to forbid its being read.

Being now in a declining state of health, the archbishop used in the summer to go to Hampshire for the sake of recreation; and being invited by lord Zouch to hunt in his park at Bramzill, he met there* with the greatest misfortune that ever befel him; for he accidentally killed the game keeper by an arrow from a cross-bow which he shot at one of the deer This accident threw him into a deep melancholy; and he ever afterwards kept a monthly fast on Tuesday, the day on which this fatal mischance happened, and he settled an annuity of 20*l.* on the widow. There were several persons who took an advantage of this misfortune, to lessen him in the king's favour; but his Majesty said, "An angel might have miscarried in this sort." His enemies alledging that he had incurred an irregularity, and was thereby incapacitated for performing the office of a primate; the king directed a commission to ten persons to inquire into this matter.

*Fuller's church hist. cent xviii, p. 87.

The result, however, was not satisfactory to his Graces' enemies; it being declared, that as the murder was involuntary, he had not forfeited his archiepiscopal character. The archbishop thenceforward seldom assisted at the council, being chiefly hindered by his infirmities; but in the king's last illness he was sent for, and attended with great constancy till his Majesty expired on the 27th of March 1625. He performed the ceremony of the coronation of king Charles I. though very infirm and much troubled with the gout. He was never greatly in this king's favour; and the duke of Buckingham being his declared enemy, watched an opportunity of making him feel the weight of his displeasure. This he at last accomplished, upon the archbishop's refusing to licence a sermon, preached by Dr Sibthorpe to justify a loan which the king had demanded, and pregnant with principles which tended to overthrow the constitution. The archbishop was immediately after suspended from all his functions as primate; and they were exercised by certain bishops commissioned by the king, of whom Laud, the archbishop's enemy, and afterwards his successor, was one: while the only cause assigned for this procedure was, That the archbishop could not at that time personally attend those services which were otherwise proper for his cognisance and direction. He did not, however, remain long in this situation; for a parliament being absolutely necessary, his Grace was sent for, and restored to his authority and jurisdiction. But not proving friendly to certain rigorous measures adopted by the prevailing church-party, headed by Laud, whose power and interest at court were now very considerable, his presence became unwelcome there; so that upon the birth of the Prince of Wales, afterwards Charles II. Laud had the honour to baptize him, as dean of the chapel. The archbishop being worn out with cares and infirmities, died at Croydon, the 5th of August 1633, aged 71 years; and was buried at Guilford, the place of his nativity, and where he had endowed an hospital with lands to the amount of 300*l.* per annum. A stately monument was erected over the grave, with the effigy of the archbishop in his robes.

He shewed himself, in most circumstances of his life, a man of great moderation to all parties; and was desirous that the clergy should attract the esteem of the laity by the sanctity of their manners, rather than claim it as due to their function. His notions and principles, however, not suiting the humour of some writers, have drawn upon him many severe reflections; particularly, which is to be regretted, from the earl of Clarendon. But Dr Welwood has done more justice to his merit and abilities*. He wrote several tracts upon various subjects; and, as already mentioned, translated part of the New Testament, with the rest of the Oxford divines, 1611.

*Memoirs, 8vo. 1700, p. 38.

It is proper to observe here, that there was another writer of both his names, who flourished somewhat later. This George Abbot wrote *A Paraphrase on Job,*

Job, A vindication of the sabbath, and *A paraphrase on the Psalms.*

ABBOT (Robert), elder brother to the former, and born at Guildford in 1560, went through his studies in Baliol college, Oxford. In 1582, he took his degree of master of arts, and soon became a celebrated preacher; and to this talent he chiefly owed his preferment. Upon his first sermon at Worcester, he was chosen lecturer in that city, and soon after rector of All-saints in the same place. John Stanhope, Esq; happening to hear him preach at Paul's-cross, was so pleased with him, that he immediately presented him to the rich living of Bingham in Nottinghamshire. In 1597, he took his degree of doctor in divinity: and, in the beginning of king James's reign, was appointed chaplain in ordinary to his Majesty; who had such an opinion of him as a writer, that he ordered the doctor's book *De Antichristo* to be printed with his own commentary upon part of the Apocalypse. In 1609, he was elected master of Baliol College; which trust he discharged with the utmost care and assiduity, by his frequent lectures to the scholars, by his continual presence at public exercises, and by promoting temperance in the society. In November 1610, he was made prebendary of Normanton in the church of Southwell; and, in 1612, his Majesty appointed him regius professor of divinity at Oxford. The fame of his lectures became very great; and those which he gave upon the supreme power of kings against Bellarmine and Suarez, so much pleased his Majesty, that, when the see of Salisbury became vacant, he named him to that bishopric, and he was consecrated by his own brother at Lambeth, December 3, 1615. When he came to Salisbury, he found the cathedral running to decay, through the negligence and covetousness of the clergy belonging to it: however, he found means to draw five hundred pounds from the prebendaries, which he applied to the reparation of this church. He then gave himself up to the duties of his function with great diligence and assiduity, visiting his whole diocese in person, and preaching every Sunday whilst health would permit. But this was not long: for his sedentary life, and close application to study, brought upon him the gravel and stone; of which he died on the 2d of March 1618, in the fifty-eighth year of his age; having not filled the see quite two years and three months, and being one of the five bishops which Salisbury had in six years. He was buried opposite to the bishop's seat in the cathedral. Dr Fuller,* speaking of the two brothers, says, "that George was the more "plausible preacher, Robert the greatest scholar; "George the abler statesman, Robert the deepest di-"vine: gravity did frown in George, and smile in "Robert." He published several pieces; he also left behind him sundry manuscripts, which Dr Corbet made a present of to the Bodleian library.

* *Worthies of England in Surrey.*

ABBOTSBROMLEY, a town in Staffordshire, with a market on Tuesday. After the dissolution of the monasteries, it was given to the Lord Paget; and has since been called *Paget's Bromley*, and is so denominated in the county map. But it retains its old name in the king's books, and is a discharged vicarage of 20 l. clear yearly value. It likewise retains its old name with regard to the fairs. W. Long. 1. 2. Lat. 52 45.

ABBOTSBURY, a small town in Dorsetshire, with a market on Thursday. W. Long. 1. 17. Lat. 50. 40. The abbey near this town was founded by a Norman lady, about the year 1026; and Edward the Confessor and William the Conqueror were considerable benefactors to it.

ABBREVIATE *of* ADJUDICATIONS, in Scots law, an abstract or abridgement of a decreet of adjudication, which is recorded in a register kept for that purpose.

ABBREVIATION, or ABBREVIATURE, a contraction of a word or passage; made by dropping some of the letters, or by substituting certain marks or characters in their place.—Lawyers, physicians, &c. use abundance of abbreviations, partly for the sake of expedition, and partly for that of mystery; but of all people the Rabbins are the most remarkable for this practice, so that their writings are unintelligible without the Hebrew abbreviatures. The Jewish authors and copyists do not content themselves with abbreviating words like the Greeks and Latins, by retrenching some of the letters or syllables; they frequently take away all but the initial letters. They even frequently take the initials of several succeeding words, join them together, and, adding vowels to them, make a sort of barbraous word, representative of all those which they have thus abridged. Thus, Rabbi Moses ben Maimon, in their abbreviature is *Rambam*, &c.

ABBREVIATOR, in a general sense, a person who abridges any large book into a narrower compass.

ABBREVIATORS, a college of 72 persons in the chancery of Rome, who draw up the pope's brieves, and reduce petitions, when granted by him, into proper form for being converted in bulls.

ABBUTALS, signify the buttings or boundings of lands towards any point. Limits were anciently distinguished by artificial hillocks, which were called *botemines*; and hence *butting*. In a description of the site of land, the sides on the breadth are more properly *adjacents*, and these terminating the length are *abbutantes*; which, in old surveys, were sometimes expressed by *capitare*, to head, whence abbutals are now called *head-lands*.

ABCEDARY, or ABCEDARIAN, an epithet given to compositions, the parts of which are disposed in the order of the letters of the alphabet: thus we say, Abcedarian psalms, lamentations, hymns, &c.

ABCOURT, a town near St Germains, four leagues from Paris. Here is a brisk chalybeate water, impregnated with fixed air and the fossil alkali; and resembling the waters of Spa and Ilmington.

ABDALLA, the son of Abdalmothleb, was the father of the prophet Mahomet. Several other Arabians of eminence bore the same name.

ABDALMALEK, the son of Mirvan, and the 5th khalif of the race of the Ommiades, surnamed *Rasch al Hegianat, i. e.* the skinner of a stone, because of his extreme avarice; as also *Aboulzebab*, because his breath was said to be so poisonous as to kill all the flies which rested on his face. Yet he surpassed all his predecessors in power and dominion; for in his reign the Indies were conquered in the east, and his armies penetrated Spain in the west: he likewise extended his empire toward the south, by making himself master of Medina and Mecca. He began his reign in the 65th of the hegira. A. D. 648; reigned 15 years; and four of his sons enjoyed the khalifate one after another.

ABDALMELEK (Ben Zohar), an eminent physician, commonly called by the Europeans *Avenzoar*. See AVENZOAR.

ABDALMOTHLEB, or ABDAL MATELEB, the son of Hashem, the father of Abdalla, and grandfather of Mahomet the prophet of the Mussulmans, was, it is said, of such wonderful comeliness and beauty, that all women who saw him became enamoured: which may have given occasion to that prophetic light, which, according to the Arabians, shone on the foreheads of him, his ancestors, and descendents; it being certain that they were very handsome and graceful men. He died when Mahomet, of whom he had taken peculiar care, was only 8 or 9 years old; aged, according to some, 110, and according to other writers 120.

ABDALONYMUS, or ABDOLONYMUS, (in classic history), of the royal family of Sidon, and descended from king Cinyras, was contented to live in obscurity, and get his subsistence by cultivating a garden, while Strato was in possession of the crown of Sidon. Alexander the Great having deposed Strato, inquired whether any of the race of Cinyras was living, that he might set him on the throne. It was generally thought that the whole race was extinct: but at last Abdalonymus was thought of, and mentioned to Alexander; who immediately ordered some of his soldiers to fetch him. They found the good man at work, happy in his poverty, and entirely a stranger to the noise of arms, with which all Asia was at that time disturbed; and they could scarcely persuade him that they were in earnest. Alexander was convinced of his high descent by the dignity that appeared in his person; but was desirous of learning from him in what manner he bore his poverty. "I wish" said Abdalonymus, "I may bear my new condition as well: These hands have supplied my necessities: I have had nothing, and I have wanted nothing." This answer pleased Alexander so much, that, besides giving him all that was Strato's, he augmented his dominions, and gave him a large present out of the Persian spoils.

ABDALS, in the Eastern countries, a kind of saints supposed to be inspired to a degree of madness. The word comes, perhaps, from the Arabic, *Abdallah*, the servant of God. The Persians call them *devaneh khoda*, similar to the Latins way of speaking of their prophets and sibyls, *q. d. furentes deo*, raging with the god. They are often carried by excess of zeal, especially in the Indies, to run about the streets and kill all they meet of a different religion; of which travellers furnish many instances. The English call this, *running a muck*, from the name of the instrument, a sort of poniard, which they employ on these desperate occasions. If they are killed, as it commonly happens, before they have done much mischief, they reckon it highly meritorious; and are esteemed, by the vulgar, martyrs for their faith.

ABDARA, or ABDERA, (anc. geog.) a town of Bœotia in Spain, a Phœnician colony; now *Adra*, to the west of Almeira in the kingdom of Granada.

ABDERA, (anc. geog.) a maritime town of Thrace, not far from the mouth of the river Nessus, on the east side. The foundation, according to Herodotus, was attempted to be laid by Timesius the Clazomenian; but he was forced by the Thracians to quit the design. The Teians undertook it, and succeeded; settling there, in order to avoid the insults of the Persians. —Several singularities are told of Abdera.* The grass of the country round it was so strong, that such horses as eat of it ran mad. In the reign of Cassander king of Macedon, this city was so pestered with frogs and rats, that the inhabitants were forced to quit it for a time. —The Abderites, or Abderitani, were very much derided for their want of wit and judgment: yet their city has given birth to several eminent persons; as, Protagoras, Democritus, Anaxarchus, Hecatæus the historian, Nicenætus the poet, and many others, who were mentioned among the illustrious men.—In the reign of Lysimachus, Abdera was afflicted for some months with a most extraordinary disease †: this was a burning fever, whose crisis was always on the seventh day, and then it left them; but it so distracted their imaginations, that they fancied themselves players. After this, they were ever repeating verses from some tragedy, and particularly out of the Andromeda of Euripides, as if they had been upon the stage; so that many of these pale, meagre actors, were pouring forth their tragic exclamations in every street. This delirium continued till the winter following; which was a very cold one, and therefore fitter to remove it. Lucian, who has described this disease, endeavours to account for it in this manner: Archelaus, an excellent player, acted the Andromeda of Euripides before the Abderites, in the height of a very hot summer. Several had a fever at their coming out of the theatre; and as their imaginations were full of the tragedy, the delirium which the fever raised represented perpetually Andromeda, Perseus, Medusa, &c. and the several dramatic incidents, and called up the ideas of those objects, and the pleasure of the representation, so strongly, that they could not forbear imitating Archelaus's action and declamation: And from these the fever spread to others by infection.

* Plinii, lib. xxv. c. 8. Just. lib. xv. c. 2.

† Lucianus *quomodo Hist. sit conscribendus, initio.*

ABDERAHMA, a Saracen viceroy in Spain, who revolted, and formed an independent principality at Cordova. He had several successors of the same name.

ABDEST, a Persian word, properly signifying the water placed in a bason for washing the hands; but is used to imply the legal purifications practised by the Mahometans before they enter on their religious ceremonies.

ABDIAS OF BABYLON, one of the boldest legend-writers, who boasted he had seen our Saviour, that he was one of the 72 disciples, had been eye-witness of the actions and prayers at the deaths of several of the apostles, and had followed into Persia St Simon and St Jude, who, he said, made him the first bishop of Babylon. His book intitled *Historia certaminis apostolici*, was published by Wolfgang Lazius, at Bazil, 1551; and it has since borne several impressions in different places.

ABDICATION, the action whereby a magistrate, or person in office, renounces and gives up the same before the term of service is expired.

This word is frequently confounded with *resignation*; but differs from it, in that abdication is done purely and simply, whereas resignation is in favour of some third person. It is said to be a renunciation, quitting, and relinquishing, so as to have nothing further to do with a thing; or the doing of such actions as are inconsistent with the holding of it. On king James's leaving the kingdom, and abdicating the government, the lords

lords would have had the word *deſertion* made uſe of; but the commons thought it was not comprehenſive enough, for that the king might then have liberty of returning.—Among the Roman writers it is more particularly uſed for the act whereby a father diſcarded or diſclaimed his ſon, and expelled him the family. It is diſtinguiſhed from *exhæredatio* or *diſinheriting*, in that the former was done in the father's lifetime; the latter, by will at his death: ſo that whoever was abdicated, was alſo diſinherited; but not *vice verſa*.

ABDOMEN, in anatomy, is that part of the trunk of the body which lies between the thorax and the bottom of the pelvis. See ANATOMY.

ABDOMINALES, or ABDOMINAL FISHES, conſtitute the IV[th] Order of the *Fourth Claſs* of Animals, in the Linnæan ſyſtem. See ZOOLOGY.

ABDUCTION, in logic, a kind of argumentation, by the Greeks called *apagoge* wherein the greater extreme is evidently contained in the medium, but the medium not ſo evidently in the leſſer extreme as not to require ſome farther medium or proof to make it appear. It is called *abduction*, becauſe, from the concluſion, it draws us on to prove the propoſition aſſumed. Thus in the ſyllogiſm, "All whom God abſolves are free from ſin; but God abſolves all who are in Chriſt; therefore all who are in Chriſt are free from ſin,"—the major is evident; but the minor, or aſſumption, is not ſo evident without ſome other propoſition to prove it, as, "God received full ſatisfaction for ſin by the ſufferings of Jeſus Chriſt."

ABDUCTION, in ſurgery, a ſpecies of fracture, wherein the broken parts of the bone recede from each other.

ABDUCTOR, or ABDUCENT, in anatomy, a name given to ſeveral of the muſcles, on account of their ſerving to withdraw, open, or pull back the parts to which they belong.

ABEL, ſecond ſon of Adam and Eve, was a ſhepherd. He offered to God ſome of the firſtlings of his flock, at the ſame time that his brother Cain offered the fruits of the earth. God was pleaſed with Abel's oblation, but diſpleaſed with Cain's; which ſo exaſperated the latter, that he roſe up againſt his brother and killed him. Theſe are the only circumſtances Moſes relates of him; though, were we to take notice of the ſeveral particulars to which curioſity has given birth on this occaſion, they would run to a very great length. But this will not be expected. It is remarkable, that the Greek churches, who celebrate the feaſts of every other patriarch and prophet, have not done the ſame honour to Abel. His name is not to be found in any catalogue of ſaints or martyrs till the 10[th] century; nor even in the new Roman martyrology. However he is prayed to, with ſome other ſaints, in ſeveral Roman litanies ſaid for perſons who lie at the point of death.

ABEL Keramim, or *Vincarum*, beyond Jordan, in the country of the Ammonites, where Jephthah defeated them, ſeven miles diſtant from Philadelphia, abounding in vines, and hence the name. It was alſo called *Abela*.

ABEL-Mehola, the country of the prophet Eliſha, ſituate on this ſide Jordan, between the valley of Jezreel and the village Bethmaela in the plains of Jordan, where the Midianites were defeated by Gideon. Judges, vii. 22.

ABEL-Mizraim, called alſo the threſhing-floor of Atad; ſignifying the lamentation of the Egyptians; in alluſion to the mourning for Jacob, Gen. l. 3, 10, 11. Suppoſed to be near Hebron.

ABEL-Moſch, or *Abelmoſch*, in botany, the trivial name of a ſpecies of the HIBISCUS.

ABEL-Sattim, or *Sittim*, a town in the plains of Moab, to the N. E. of the Dead Sea, not far from Jordan, where the Iſraelites committed fornication with the daughters of Moab: So called, probably, from the great number of Sittim-trees there.

ABELARD (Peter), one of the moſt famous doctors of the twelfth century, was born at Palais near Nantz, in Britany: he was well learned in divinity, philoſophy, and the languages; but was particularly diſtinguiſhed by his ſkill in logic, and his fondneſs for diſputations, which led him to travel into ſeveral provinces in order to give public proof of his acuteneſs in that ſcience.

After having baffled many antagoniſts, he read lectures in divinity with great applauſe at Paris; where he boarded with a canon whoſe name was Fulbert, and who had a very beautiful niece named Heloiſe. The canon ardently wiſhed to ſee this young lady make a figure among the learned, and Abelard was made her preceptor: but inſtead of inſtructing her in the ſciences, he taught her to love. Abelard now performed his public functions very coldly, and wrote nothing but amorous verſes. Heloiſe proving with child, Abelard ſent her to a ſiſter of his in Britany, where ſhe was delivered of a ſon. To ſoften the canon's anger, he offered to marry Heloiſe privately; and the old man was better pleaſed with the propoſal than the niece, who, from a ſingular exceſs of paſſion, choſe to be Abelard's miſtreſs rather than his wife. She married, however, but uſed often to proteſt upon oath that ſhe was ſingle, which provoked the canon to uſe her ill. Upon this, Abelard ſent her to the monaſtery of Argenteuil; where ſhe put on a religious habit, but did not take the veil. Heloiſe's relations conſidering this as a ſecond treachery, hired ruffians, who, forcing into his chamber in the dead of the night, emaſculated him. This infamous treatment made him fly to the gloom of a cloiſter. He aſſumed the monaſtic habit in the abbey of St Dennis; but the diſorders of that houſe ſoon drove him from thence. He was afterwards charged with hereſy; but after ſeveral perſecutions for his religious ſentiments, he ſettled in a ſolitude in the dioceſe of Troies, where he built an oratory, to which he gave the name of the Paraclet. He was afterwards choſen ſuperior of the abbey of Ruis in the dioceſe of Vannes: when the nuns being expelled from the nunnery in which Heloiſe had been placed, he gave her his oratory; where ſhe ſettled with ſome of her ſiſter nuns, and became their prioreſs.

Abelard mixed the philoſophy of Ariſtotle with his divinity, and in 1140 was condemned by the council of Rheims and Sens. Pope Innocent II. ordered him to be impriſoned, his books to be burnt, and forbid him ever teaching again. However, he was ſoon after pardoned, at the ſolicitation of Peter the Venerable, who received him into his abbey of Clugni, where he led an exemplary life. He died in the priory of Marcellus at Chalons, April 21, 1142, aged ſixty-three. His corpſe was ſent to Heloiſe, who buried it in the Paraclet. He left ſeveral works: the moſt celebrated of which are those tender letters that passed between him and Heloise, with the account of their misfortunes prefixed; which have been translated into English, and immortalised by the harmony of Mr Pope's numbers.

ABEL-TREE, or ABELE-TREE, an obsolete name for a species of the poplar. See POPULUS.

ABELIANS, ABEOLITES, or ABELONIANS, in church-history, a sect of heretics mentioned by St Austin, which arose in the diocese of Hippo in Africa, and is supposed to have begun in the reign of Arcadius, and ended in that of Theodosius. Indeed it was not calculated for being of any long continuance. Those of this sect regulated marriage after the example of Abel; who, they pretended, was married, but died without ever having known his wife. They therefore allowed each man to marry one woman, but enjoined them to live in continence: and, to keep up the sect, when a man and woman entered into this society, they adopted a boy and a girl, who were to inherit their goods, and to marry upon the same terms of not begetting children, but of adopting two of different sexes.

ABELLA, anciently a town of Campania, near the river Clanius. The inhabitants were called Abellani, and said to have been a colony of Chalcidians. The nux Avellana, called also Prænestina, or the hazelnut, takes its name from this town, according to Macrobius. Now *Avella*.

ABELLINUM, anciently a town of the Hirpini, a people of Apulia; distant about a mile from the rivulet Sabbato, between Beneventum and Salernum. Pliny calls the inhabitants Abellinates, with the epithet protopi, to distinguish them from the Abellinates Marsi. Now *Avellino*. E. Long. 15. 20. Lat. 21.

ABEN EZRA (Abraham), a celebrated rabbi, born at Toledo in Spain, called by the Jews, The wise, great, and admirable Doctor, was a very able interpreter of the Holy Scriptures; and was well skilled in grammar, poetry, philosophy, astronomy, and medicine. He was also a perfect master of the Arabic. His principal work is, Commentaries on the Old Testament, which is much esteemed: these are printed in Bomberg's and Buxtorf's Hebrew Bibles. His stile is clear, elegant, concise, and much like that of the Holy Scriptures: he almost always adheres to the literal sense, and every where gives proofs of his genius and good sense: he, however, advances some erroneous sentiments. The scarcest of all his books is intitled, Jesud Mora; which is a theological work, intended as an exhortation to the study of the Talmud. He died in 1174, aged 75.

ABEN Meller, a learned rabbin, who wrote a commentary on the Old Testament in Hebrew, intitled The Perfection of beauty. This rabbin generally follows the grammatical sense and the opinions of Kimchi. The best edition is that of Holland.

ABENAS, a town in France, in Languedoc and in the lower Vivarais, seated on the river Ardesch, at the foot of the Cevennes. E. Long. 4. 43. Lat. 44. 40.

ABENEL GAUBY, a fixed star of the second or third magnitude, on the south scale of the constellation LIBRA.

ABENSPERG, a small town of Germany, in the circle and dutchy of Bavaria, and in the government of Munich. It is seated on the river Abentz, near the Danube. E. Long. 11. 38. Lat. 48. 45.

ABERAVON, a borough town of Glamorganshire in Wales, governed by a portreeve. It had a market, which is now discontinued: the vicarage is discharged, and is worth 45l. clear yearly value. It is seated on the mouth of the river Avon, 194 miles west of London. W. Long. 3. 21. Lat. 51. 40.

ABERBROTHICK, or ARBROATH, one of the royal boroughs of Scotland, situated in the county of Angus, about forty miles N. N. E. of Edinburgh; its W. Long. being 2. 29. and N. Lat. 56. 36. It is seated on the discharge of the little river Brothic into the sea, as the name imports, *Aber* in the British implying such a situation. It is a small but flourishing place, well built, and still increasing. The town has been in an improving state for the forty last years, and the number of inhabitants greatly augmented; which is owing to the introduction of manufactures. The number, at this time, is said to be about four thousand: these principally consist of weavers of coarse brown linens, and some sail-cloth; others are employed in making white and coloured threads: the remainder are either engaged in the shipping of the place, or in the necessary and common mechanic trades. The brown linens, or Osnaburghs, were manufactured here before any encouragement was given by Government, or the linen company erected at Edinburgh. It appears from the books of the stamp-office in this town, that seven or eight hundred thousand yards are annually made in the place, and a small district round. Besides this export and that of thread, much barley and some wheat is sent abroad. The foreign imports are flax, flax seed, and timber, from the Baltic. The coasting trade consists of coals from Borrowstounness, and lime from Lord Elgin's kilns in Fife.—At this place, in default of a natural harbour, a tolerable artificial one of piers has been formed, where, at spring-tides, which rise here fifteen feet, ships of two hundred tons can come, and of eighty at neap-tides; but they must lie dry at low water. This port is of great antiquity: there is an agreement yet extant between the abbot and the burghers of Aberbrothick, in 1194, concerning the making of the harbour. Both parties were bound to contribute their proportions; but the largest fell to the share of the former, for which he was to receive an annual tax payable out of every rood of land lying within the borough.—The glory of this place was the abbey, whose very ruins give some idea of its former magnificence. It was founded by William the Lion in 1178, and dedicated to the celebrated primate Thomas à Becket. The founder was buried here; but there are no remains of his tomb, or of any other, excepting that of a monk of the name of Alexander Nicol. The monks were of the Tyronesian order; and were first brought from Kelso, whose abbot declared those of this place, on the first institution, to be free from his jurisdiction. The last abbot was the famous Cardinal Beaton, at the same time archbishop of St Andrew's, and, before his death. as great and absolute here as Wolsey was in England. King John, the English monarch, granted this monastery most uncommon privileges; for, by charter under his great seal, he exempted it *a teloniis et consuetudine* in every part of England, except London. At Aberbrothick is a chalybeate water, similar to those of Peterhead and Glendy.

Aberconway, Aberdeen.

ABERCONWAY, or CONWAY, Carnarvonshire, North-Wales; so called from its situation at the mouth of the river Conway. It is a handsome town, pleasantly situated on the side of a hill, and has many conveniences for trade; notwithstanding which it is the poorest town in the county. It was built by Edward I. and had not only walls, but a strong castle which is now in ruins. Here is an inscription on the tomb of one Nicholas Hooks, importing that he was the one-and-fortieth child of his father, and had twenty-seven children himself. It is 229 miles from London, W. Long. 3. 47. N. Lat. 53. 20.

ABERDEEN, the name of two cities in Scotland, called the *Old* and *New Towns*, situated on the German ocean, in W. Long. 1. 40. and N. Lat. 57. 19.

Aberdeen is a place of great antiquity. According to tradition, it was of note in the reign of Gregory, who conferred on it some privileges about the year 893. In 1004, Malcolm II. founded a bishopric at a place called Mortlich in Bauffshire, in memory of a signal victory which he there gained over the Danes: which bishopric was translated to Old Aberdeen by David I.; and in 1163, the then bishop of Aberdeen obtained a new charter from Malcolm IV. There is extant a charter of Alexander II. by which, in 1217, the King grants to Aberdeen the same privileges he had granted to his town of Perth.

The Old Town lies about a mile to the north of the new, at the mouth of the river Don, over which is a fine Gothic bridge, of a single arch, greatly admired, which rests at both sides on two rocks. This arch, said to have been built by a bishop of Aberdeen about the year 1290, is 67 feet wide at the bottom, and 34½ feet high above the surface of the river, which at ebb-tide is here 19 feet deep. The old town was formerly the seat of the bishop, and had a large cathedral commonly called *St Macher's*. Two very antique spires, and one aisle, which is used as a church, are now the only remains of it. The bishopric was founded in the time of David I. as abovementioned. The cathedral had anciently two rows of stone pillars across the church, and three turrets; the steeple, which was the largest of these turrets, rested upon an arch, supported by four pillars. In this cathedral there was a fine library; but, about the year 1560, it was almost totally destroyed. But the capital building is the King's-college, on the south side of the town, which is a large and stately fabric. It is built round a square, with cloisters on the south side. The chapel is very ruinous within; but there still remains some wood-work of exquisite workmanship. This was preserved by the spirit of the principal at the time of the reformation, who armed his people and checked the blind zeal of the barons of the Mearns; who, after stripping the cathedral of its roof, and robbing it of the bells, were going to violate this seat of learning. They shipped their sacrilegious booty, with an intention of exposing it to sale in Holland: but the vessel had scarcely gone out of port, when it perished in a storm with all its ill-gained lading. The steeple is vaulted with a double cross arch; above which is an imperial crown, supported by eight stone-pillars, and closed with a globe and two gilded crosses. In the year 1631 this steeple was thrown down by a storm, but was soon after rebuilt in a more stately form. This college was founded in 1494, by William Elphinston bishop of this place, Lord Chancellor of Scotland in the reign of James III. and Lord Privy Seal in that of James IV. But James IV. claimed the patronage of it, and it has since been called the *King's College*. This college, and the Marischal-college in the New Town, form one university, called the *University of King Charles*. The library is large, but not remarkable for many curiosities. Hector Boethius was the first principal of the college; and sent for from Paris for that purpose, on an annual salary of forty marks Scots, at thirteen pence each. The square tower on the side of the college was built by contribution from General monk and the officers under him then quartered at Aberdeen, for the reception of students; of which there are about a hundred belonging to the college who lie in it.

Aberdeen.

The New Town is the capital of the shire of Aberdeen. For largeness, trade, and beauty, it greatly exceeds any town in the north of Scotland. It is built on a hill or rising ground, and lies on a small bay formed by the Dee, deep enough for a ship of 200 tons, and above two miles in circumference.—The buildings (which are of granite from the neighbouring quarries) are generally four stories high; and have, for the most part, gardens behind them, which gives it a beautiful appearance. On the high-street is a large church, which formerly belonged to the Franciscans. This church was begun by Bishop William Elphinston; and finished by Gavinus Dunbar, bishop of Aberdeen, about the year 1500. Bishop Dunbar is said likewise to have built the bridge over the Dee, which consists of seven arches. In the middle of Castle-street is an octagon building, with neat bas-relievos of the kings of Scotland from James I. to James VII. The town-house makes a good figure, and has a handsome spire in the centre. The grammar-school is a low but neat building. Gordon's hospital is handsome; in front is a good statue of the founder: it mantains forty boys, who are apprenticed at proper ages. The infirmary is a large plain building, and sends out between eight and nine hundred cured patients annually. But the chief public building in the new town is the Marischal-college, founded by George Kieth earl of Marischal, in the year 1593; but since greatly augmented with additional buildings. There are about 140 students belonging to it. In both the Marischal and King's college the languages, mathematics, natural philosophy, divinity, &c. are taught by very able professors. The convents in Aberdeen were: One of Mathurines, or of the order of the Trinity, founded by William the Lion, who died in 1214; another of Dominicans, by Alexander II.; a third of Observantines, a building of great length in the middle of the city, founded by the citizens and Mr Richard Vans, &c.; and a fourth of Carmelites, or White Friars, founded by Philip de Arbuthnot in 1350.

Aberdeen, including the Old Town, is supposed to contain 25,000 people. Its trade is considerable, but might be greatly extended by an attention to the white fisheries.

The harbour was long a great detriment to its trade, and occasioned the loss of many lives and much property. A stranger could never depend upon finding it as he left it; while vessels lay at anchor in the road till the tide should make, they have often been wrecked by

storms

Aberdeen.

storms which suddenly arose. It was very narrow at the mouth, having the easterly rocky point of the Grampian mountains on the south, and a flat blowing sand on the north, extending along the coast for many miles. By the easterly and north-east storms the sand was driven in a long ridge across the harbour's mouth, and formed what was called the *bar*. Upon this bar the depth of water at low tide was sometimes not above three feet. Clearing away the sand, though but a partial and temporary remedy, was a matter of great expence to the community: If it was cleared one week so as to have five or six feet of water at ebb, a fresh storm the next week undid all that had been done. The town at last came to a resolution of erecting a strong pier on the north side of the harbour. This pier is 1200 feet in length, and gradually increases in thickness and height as it approaches the sea, where the head or rounding is 60 feet diameter at the base, and the perpendicular elevation is 38 feet. The whole is built of granite, the most durable stone known: many of the outside stones are about three tons weight, with hewn beds. It was built under the direction of Mr Smeaton; and the expence, amounting to above 17,000l. is defrayed by doubling the harbour-dues, which are chiefly paid by the inhabitants.

A little to the south of the bar, they have now a depth of 7 fathoms at low water; and at the harbour mouth, from eight to nine fathoms, where they had formerly but a few feet.

Aberdeen once enjoyed a good share of the tobacco trade. At present, its imports are from the Baltic, and a few merchants trade to the West Indies and North America. Its exports are stockings, thread, salmon, and oatmeal. The first is a most important article, as appears by the following state of it. For this manufacture, 20,800 pounds worth of wool is annually imported, and 1600 pounds worth of oil. Of this wool are annually made 69,333 dozen pairs of stockings; worth, at an avarage, 1l. 10s. *per* dozen. These are the work of the country-people in almost all parts of this great county, who get 4s. *per* dozen for spinning, and 14s. *per* dozen for knitting; so that there is annually paid them 62,329l. 14. There is, besides about 2000l. value of stockings manufactured from the wool of the county. The thread manufacture is another considerable article, though trifling in comparison of the woollen. The salmon fisheries on the Dee and the Don are a good branch of trade. About 46 boats, and 130 men, are employed on the first; and, in some years, 167,000 lb. of fish have been sent pickled to London, and about 930 barrels of salted fish exported to France, Italy, &c.—The fishery on the Don is far less considerable. The fish of this river are taken in cruives above the bridge; a practice contrary to the ancient laws of the kingdom, unless where the nature of the water rendered the net-fishery impracticable. The inhabitants likewise export considerable quantities of pickled pork, which they sell to the Dutch for victualling their East India ships and men of war; the Aberdeen pork having the reputation of being the best cured of any in Europe for keeping on long voyages.

"It is however remarkable, (Mr Knox observes), that there is not a single decked vessel fitted out from Aberdeen for the herring or white fisheries: here is now an excellent harbour; an active people, conversant in trade, and possessed of capital, seated within six hours sailing of Long Fortys, and two days sailing of the Shetland Isles. This inattention is the more extraordinary, as the exports of Aberdeen, though very considerable, do not balance the imports in value. The herring and white fisheries, therefore, if prosecuted with vigour, cured and dried with judgment, would not only extend the scale of exports, but also furnish the outward bound vessels with freights, and better assortments for the foreign markets. The salmon of the Dee and Don are taken in great abundance, cured in the highest perfection, and greatly valued at the European markets. If the merchants, in addition to these, should also export the cargoes of 50 or 60 vessels constantly employed in the herring and white fisheries, the port of Aberdeen would in a few years become the most celebrated mart of fish now existing."

From a round hill at the west end of the city, flow two springs, one of pure water and the other of a quality resembling the German Spa. Aberdeen, with Aberbrothick, Brechin, Montrose, and Inverbervie, returns one member to Parliament.

Aberdeenshire ‖ Abergavenny.

ABERDEENSHIRE, comprehends the districts of Mar, Garioch, Strathbogie, and the greater part of Buchan; and sends one member to Parliament. It is washed on the east and north by the ocean; and abounds in sea-ports, from whence there is a safe and ready passage to the Orkneys and Shetland Isles, the Greenland fisheries, Norway, and the regions round the Baltic, the German coast, Holland, Flanders, France. It is watered by numerous streams, all of them the resort of salmon, and whose banks display the most extensive plantations as well as natural woods in Britain.

ABERDOUR, a small town in Fifeshire, Scotland, on the frith of Forth, about ten miles N. W. of Edinburgh. In old times it belonged to the Viponts; in 1126 it was transferred to the Mortimers by marriage, and afterwards to the Douglases. William, lord of Liddesdale, surnamed the *Flower of chivalry*, in the reign of David II. by charter conveyed it to James Douglas, ancestor of the present noble owner the Earl of Morton. The monks of Inchcolm had a grant for a burial-place here from Allan de Mortimer, in the reign of Alexander III. The nuns, usually styled the poor *Clares*, had a convent at this place.

ABERFORD, a market-town in the west riding of Yorkshire, stands in a bottom; and is about a mile long, and indifferently well built. It is near a Roman road, which is raised very high, and not far from the river Cock; between which and the town there is the foundation of an old castle still visible. It is 181 miles north-by-west from London. W. Long. 2. 45. Lat. 55. 52.

ABERGAVENNY, a large, populous, and flourishing town in Monmouthshire, seated at the confluence of the rivers Usk and Gavenny. It has a fine bridge over the Usk, consisting of fifteen arches; and being a great thoroughfare from the west part of Wales to Bath, Bristol, Gloucester, and other places, is well furnished with accommodations for travellers. It is surrounded with a wall, and had once a castle. It carries on a considerable trade in flannels, which are brought hither for sale from the other parts of the county.

county. It is 142 miles distant from London. W. Long. 2. 45. Lat. 51. 50. Abergavenny appears to have been the *Gibbanium* of Antoninus, and the town of Usk his *Burrium*.

ABERNETHY (John), an eminent dissenting minister, was the son of Mr John Abernethy a dissenting minister in Colraine, and was born on the 19th of October 1680. When about nine years of age, he was separated from his parents, his father being obliged to attend some public affairs in London; and his mother, to shelter herself from the mad fury of the Irish rebels, retiring to Derry, a relation who had him under his care, having no opportunity of conveying him to her, took him with him to Scotland; by which means he escaped the hardships he must have suffered at the siege of Derry, where Mrs Abernethy lost all her other children. He afterwards studied at the university of Glasgow, till he took the degree of master of arts; and, in 1708, he was chosen minister of a dissenting congregation at Antrim, where he continued above twenty years. About the time of the Bangorian controversy (for which, see HOADLEY), a dissension arose among his brethren in the ministry at Belfast, on the subject of subscription to the Westminster confession; in which he became a leader on the negative side, and incurred the censure of a general synod. Being in consequence deserted by the greatest part of his congregation, he accepted an invitation to settle in Dublin, where his preaching was much admired. He was distinguished by his candid, free, and generous sentiments; and died of the gout in Dec. 1740, in the sixtieth year of his age. He published a volume of sermons on the Divine Attributes; after his death a second volume was published by his friends; and these were succeeded by four other volumes on different subjects: all of which have been greatly admired.

ABERNETHY, a town in Strathern, a district of Perthshire in Scotland. It is seated on the river Tay, a little above the mouth of the Erne. It is said to have been the seat of the Pictish kings; and was afterwards the see of an archbishop, since transferred to St Andrews. It is now greatly decayed.

ABERRATION, in astronomy, a small apparent motion of the fixed stars discovered by the late Dr Bradley. The discovery was made by accident in the year 1725, when Mr Molyneux and Dr Bradley began to observe the bright star in the head of *Draco*, marked γ by Bayer, as it passed near the zenith, with an instrument made by Mr Graham, in order to discover the parallax of the earth's annual orbit; and, after repeated observations, they found this star, about the beginning of March 1726, to be 20″ more southerly than at the time of the first observation. It now indeed seemed to have arrived at its utmost limit southward; because, in several trials made about this time, no sensible difference was observed in its situation. By the middle of April, it appeared to be returning back again toward the north; and, about the beginning of June, it passed at the same distance from the zenith as it had done in December, when it was first observed: in September following, it appeared 39″ more northerly than it was in March, just the contrary way to what it ought to appear by the annual parallax of the stars. This unexpected phenomenon perplexed the observers very much; and Mr Molyneux died before the true cause of it

was discovered. After this, Dr Bradley, with another instrument more exact and accurately adapted to this purpose, observed the same appearances not only in that but many other stars: and, by the great regularity that appeared in a series of observations made in all parts of the year, the Doctor was fully satisfied with regard to the general laws of the phenomena; and therefore endeavoured to find out the cause of them. He was already convinced, that the apparent motion of the stars was not owing to a nutation of the earth's axis. The next thing that offered itself, was an alteration in the direction of the plumb line, with which the instrument was constantly rectified; but this, upon trial, proved insufficient. Then he had recourse to what refraction might do; but here also nothing satisfactory occurred. At last this acute astronomer found, that the phenomena in question proceeded from the progressive motion of light, and the earth's annual motion in its orbit: for he perceived, that if light was propagated in time, the apparent place of a fixed object would not be the same when the eye is at rest, as when it is moving in any other direction than that of the line passing through the eye and object; and that, when the eye is moving in different directions, the apparent place of the object would be different.

ABERRATION, in optics, is used to denote that error or deviation of the rays of light, when inflected by a lens or speculum, whereby they are hindered from meeting or uniting in the same point. There are two species of the aberrations of rays, distinguished by their different causes; one arising from the figure of the glass or speculum, the other from the unequal refrangibility of the rays of light. This last species is sometimes called the Newtonian, from the name of its discoverer. See OPTICS, nº 17. 136. 173.

ABERYSWITH, a market-town of Cardiganshire, in Wales, seated on the Ridal, near its confluence with the Istwith, where it falls into the sea. It is a populous, rich town, and has a great trade in lead, and a considerable fishery of whiting, cod, and herrings. It was formerly surrounded with walls, and fortified with a castle; but both are now in ruins. Its distance from London is 199 miles west-south-west. W. Long. 4. 15. Lat. 52. 30.

ABESTA, the name of one of the sacred books of the Persian magi, which they ascribe to their great founder Zoroaster. The abesta is a commentary on two others of their religious books called *Zend* and *Pazend*; the three together including the whole system of the Ignicold, or worshippers of fire.

ABETTOR, a law-term, implying one who encourages another to the performance of some criminal action, or who is art and part in the performance itself. Treason is the only crime in which abettors are excluded by law, every individual concerned being considered as a principal. It is the same with *Art-and-part* in the Scots law.

ABEX, a country in High Ethiopia, in Africa, bordering on the Red Sea, by which it is bounded on the east. It has Nubia or Sennar on the north; Sennar and Abyssinia on the west; and Abyssinia on the south. Its principal towns are Suaquem and Arkeko. It is subject to the Turks, and has the name of the Beglerbeg of Habeleth. It is about five hundred miles in length and one hundred in breadth, and is a wretched country; for the heat here is almoſt inſupportable, and the air is ſo unhealthy, that an European cannot ſtay long in it without the utmoſt hazard of his life. It is very mountainous, inſomuch that there are many more wild beaſts than men. There are foreſts, in which grow a great number of ebony trees.

ABEYANCE, in law, the expectancy of an eſtate. Thus if lands be leaſed to one perſon for life, with reverſion to one another for years, the remainder for years is an abeyance till the death of the leſſee.

ABGAR, or Abgarus, a name given to ſeveral of the kings of Edeſſa in Syria. The moſt celebrated of them is one who, it is ſaid, was cotemporary with Jeſus Chriſt; and who having a diſtemper in his feet, and hearing of Jeſus's miraculous cures, requeſted him, by letter, to come and cure him. Euſebius*, who believed that his letter was genuine, and alſo an anſwer our Saviour is ſaid to have returned to it, has tranſlated them both from the Syriac, and aſſerts that they were taken out of the archives of the city of Edeſſa. The firſt is as follows: "Abgarus, prince of Edeſſa, to "Jeſus the holy Saviour, who hath appeared in the fleſh "in the confines of Jeruſalem, greeting. I have heard "of thee, and of the cures thou haſt wrought without "medicines or herbs. For it is reported thou makeſt "the blind to ſee, the lame to walk, lepers to be clean, "devils and unclean ſpirits to be expelled, ſuch as "have been long diſeaſed to be healed, and the dead "to be raiſed; all which when I heard concerning "thee, I concluded with myſelf, That either thou "waſt a God come down from heaven, or the Son of "God ſent to do theſe things. I have therefore writ-"ten to thee, beſeeching thee to vouchſafe to come "unto me, and cure my diſeaſe. For I have alſo heard "that the Jews uſe thee ill, and lay ſnares to deſtroy "thee. I have here a little city, pleaſantly ſituated, "and ſufficient for us both. Abgarus." To this letter, Jeſus, it is ſaid, returned an anſwer by Ananias, Abgarus's courier; which was as follows: "Bleſſed "art thou, O Abgarus! who haſt believed in me "whom thou haſt not ſeen; for the ſcriptures ſay of "me, They who have ſeen me have not believed in "me, that they who have not ſeen, may, by believing, "have life. But whereas thou writeſt to have me "come to thee, it is of neceſſity that I fulfil all things "here for which I am ſent; and having finiſhed them, "to return to him that ſent me: but when I am re-"turned to him, I will then ſend one of my diſciples "to thee, who ſhall cure thy malady, and give life to "thee and thine. Jesus." After Jeſus's aſcenſion, Judas, who is alſo named Thomas, ſent Thaddeus, one of the ſeventy, to Abgarus; who preached the goſpel to him and his people, cured him of his diſorder, and wrought many other miracles: which was done, ſays Euſebius, A. D. 43.—Though the above letters are acknowledged to be ſpurious by the candid writers of the church of Rome; ſeveral Proteſtant authors, as Dr Parker, Dr Cave, and Dr Grabe, have maintained that they are genuine, and ought not to be rejected.

* *Eccl. Hiſt.* lib. i. c. 13.

ABGILLUS (John), ſurnamed Preſter John, was ſon to a king of the Friſcii; and, from the auſterity of his life, obtained the name of *Preſter*, or Prieſt. He attended Charlemagne in his expedition to the Holy Land; but inſtead of returning with that monarch to Europe, it is pretended that he gained mighty conqueſts, and founded the empire of the Abyſſines, called, from his name, the empire of Preſter John. He is ſaid to have written the hiſtory of Charlemagne's journey into the Holy Land, and of his own into the Indies; but they are more probably trifling romances, written in the ages of ignorance.

ABIANS, anciently a people of Thrace, or (according to ſome authors) of Scythia. They had no fixed habitations; they led a wandering life. Their houſes were waggons, which carried all their poſſeſſions. They lived on the fleſh of their herds and flocks, on milk, and cheeſe, chiefly on that of mare's milk. They were unacquainted with commerce. They only exchanged commodities with their neighbours. They poſſeſſed lands, but they did not cultivate them. They aſſigned their agriculture to any who would undertake it, reſerving only to themſelves a tribute; which they exacted, not with a view to live in affluence, but merely to enjoy the neceſſaries of life. They never took arms but to oblige thoſe to make good a promiſe to them by whom it had been broken. They paid tribute to none of the neighbouring ſtates. They deemed themſelves exempt from ſuch an impoſition; for they relied on their ſtrength and courage, and conſequently thought themſelves able to repel any invaſion. The Abians, we are told, were a people of great integrity. This honourable eulogium is given them by Homer. (Strabo.)

ABIATHAR, high-prieſt of the Jews, ſon to Abimelech, who had borne the ſame office, and received David into his houſe. This ſo enraged Saul, who hated David, that he put Abimelech to death, and 81 prieſts; Abiathar alone eſcaped the maſſacre. He afterwards was high-prieſt; and often gave king David teſtimonies of his fidelity, particularly during Abſalom's conſpiracy, at which time Abiathar followed David, and bore away the ark. But after this, conſpiring with Adonijah, in order to raiſe him to the throne of king David his father; this ſo exaſperated Solomon againſt him, that he diveſted him of the prieſthood, and baniſhed him, A. M. 3021, before Chriſt 1014.

ABIB, ſignifying an ear of corn, a name given by the Jews to the firſt month of their eccleſiaſtical year, afterwards called *Niſan*. It commenced at the vernal equinox; and according to the courſe of the moon, by which their months were regulated, anſwered to the latter part of our March and beginning of April.

ABIDING *by* Writings, in Scots law: When a perſon founds upon a writing alleged to be falſe, he may be obliged to declare judicially, whether he will ſtand or abide by it as a true deed.

ABIES, the fir-tree. See Pinus.

ABIGEAT, an old law-term, denoting the crime of ſtealing cattle by droves or herds. This crime was ſeverely puniſhed; the delinquent being often condemned to the mines, baniſhment, and ſometimes capitally.

ABIHU, brother to Nadab, and Son of Aaron. The two former had the happineſs to aſcend mount Sinai with their father, and there to behold the glory of God: but afterward putting ſtrange fire into their cenſers, inſtead of the ſacred fire commanded by God, fire ruſhing upon them killed them. Though all the people bewailed this terrible cataſtrophe, Moſes forbad Aaron and his two ſons Eleazar and Ithamar to join in the lamentation.

ABII Scythæ, taken by Strabo to denote the European

Abimilech ‖ Abiponians.

ropean Sarmatæ, bordering on the Thracians and Bastanæ: They were commended by Curtius for their love of justice, and by Ammiesius for their contempt of earthly things.

ABIMELECH, king of Gerar, a country of the Philistines, was cotemporary with Abraham. This patriarch and his family being there, his wife Sarah, though 90 years of age, was not safe in it; for Abimelech carried her off, and was so enamoured of her, that he resolved to marry her. Abraham did not declare himself Sarah's husband; but gave out she was his sister. But the king being warned in a dream, that she was married to a prophet, and that he should die if he did not restore her to Abraham, the king obeyed; at the same time reproving Abraham for his disingenuity; who thereupon, among other excuses, said she was really his sister, being born of the same father, tho' of a different mother. Abimelech afterwards gave considerable presents to Abraham; and a covenant, that of Beersheba, was entered into between them.—After the death of Abraham, there being a famine in the neighbouring countries, Isaac his son also withdrew into Gerar, which was then likewise governed by a king called

ABIMILECH, probably the successor of the former. Here Rebekah's beauty forced her husband to employ Abraham's artifice. Abimelech discovering that they were nearly related, chid Isaac for calling his wife his sister; and at the same time forbid all his subjects, upon pain of death, to do the least injury to Isaac or Rebekah—Isaac's prosperity lost him the king's friendship, and he was desired to go from among them. He obeyed; but Abimelech afterwards entered into a covenant with him.

ABIMELECH, the natural son of Gideon, by Druma his concubine. His violent acts and death are recorded in Judges, chap. ix.

ABINGDON, a market-town in Berkshire, seated on a branch of the Thames, received its name from an abbey anciently built there. The streets, which are well paved, centre in a spacious area, in which the market is held; and in the centre of this area is the market-house, which is supported on lofty pillars, with a large hall of free-stone above, in which the summer-assizes for the county are held, and other public business done, the Lent assizes being held at Reading. It has two churches; one dedicated to St Nicholas, and the other to St Helena: the latter is adorned with a spire, and both are said to have been erected by the abbots of Abingdon. Here are also two hospitals, one for six, and the other for thirteen poor men, and as many poor women; a free school; and a charity-school. The town was incorporated by Queen Mary. It sends two members to parliament, who are chosen by the inhabitants at large not receiving alms. Its great manufacture is malt, large quantities of which are sent by water to London. It is six miles and a half south of Oxford, 47 east of Gloucester, and 55 west of London. This town is supposed by Bishop Gibson to be the place called, in the Saxon annals, *Clovesshoo*, where two synods are said to have been held, one in 742, and the other in 822. Long. 1. 20. Lat. 51.

ABINTESTATE, in the civil law, is applied to a person who inherits the right of one who died intestate or without making a will. See INTESTATE.

ABIPONIANS, a tribe of American Indians, who formerly inhabited the district of *Chaks* in Paraguay; but the hostilities of the Spaniards have now obliged them to remove southward into the territory lying between Santa Fe and St Jago. The only account we have of them is that published by M. Dobrizhoffer in 1785. This gentleman, who lived seven years in their country, informs us that they are not numerous, the whole nation not much exceeding 5000; for which he assigns as a reason an unnatural custom among their women of sometimes destroying their own children from motives of jealousy, lest their husbands should take other mates during the long time they give suck, which is not less than two years. They are naturally white, but, by exposure to the air and smoke, become of a brown colour. They are a strong and hardy race of people; which our author attributes to their marrying so late, an Abiponian seldom or never thinking of marriage till 30 years of age. They are greatly celebrated on account of their chastity and other virtues; though, according to our author, they have no knowledge of a Deity. They make frequent incursions into the territories of the Spaniards, mounted on the horses which run wild in those parts. They have a kind of order of chivalry for their warriors; and are so formidable, that 100 of their enemies will fly before ten of these horsemen. The hatred which these savages, whose manners, though rude and uncultivated, are in many respects pure and virtuous, bear to the Spaniards, is invincible. "These pretended Christians," says our author, "who are the scum of the Spanish nation, practice every kind of fraud and villainy among these poor barbarians; and their corrupt and vicious morals are so adapted to prejudice the Abiponians against the Christian religion, that the Jesuit missionaries have, by a severe law, prohibited any Spaniard from coming, without a formal permission, into any of their colonies."—From his account of the success of the Jesuits in converting them to Christianity, however, it does not appear that they have been able to do more than bribe them to a compliance with the ceremonies of the Popish superstitions; so that in general they are quite ignorant and uncivilized: a most striking instance of which is, that in counting they can go no farther than three; and all the art of the Jesuits to teach them the simplest use and expression of numbers has proved unsuccessful.

Abiponians ‖ Abjuration.

ABIRAM, a seditious Levite, who, in concert with Korah and Dathan, rebelled against Moses and Aaron, in order to share with them in the government of the people; when Moses ordering them to come with their censers before the altar of the Lord, the earth suddenly opened under their feet, and swallowed up them and their tents; and at the same instant fire came from heaven, and consumed 250 of their followers. Numb. xvi.

ABISHAI, son of Zeruiah, and brother to Joab, was one of the celebrated warriors who flourished in the reign of David: he killed with his own hand 300 men, with no other weapon but his lance; and slew a Philistine giant, the iron of whose spear weighed 300 shekels. 1 Sam. xxvi. 2 Sam. xxiii.

ABJURATION, in ancient customs, implied an oath, taken by a person guilty of felony, and who had fled to a place of sanctuary, whereby he solemnly engaged to leave the kingdom for ever.

ABJURATION, is now used in Britain to signify the renouncing, disclaiming, and denying upon oath, the Pretender to have any kind of right to the crown.

Abjuration of Heresy, the solemn recantation of any doctrine as false and wicked.

ABLACTATION, or weaning a child from the breast. See Weaning.

Ablactation, among the ancient gardeners, the same with what is called *Grafting by approach*.

ABLAI, a country of Great Tartary, the inhabitants of which, called *Buchars* or *Buchares*, are subject to Russia, but that only for protection. It lies eastward of the river Irtis, and extends five hundred leagues along the southern frontiers of Siberia.

ABLAQUEACTION, an old term in gardening, signifies the operations of removing the earth and baring the roots of trees in winter, to expose them more freely to the air, rains, snows, &c.

ABLANCOURT. See Perrot.

ABLATIVE, in grammar, the sixth case of Latin nouns. The word is formed from *auferre*, "to take away." Priscian also calls it the *comparative case*; as serving, among the Latins, for comparing, as well as taking away.

The ablative is opposite to the dative; the first expressing the action of taking away, and the latter that of giving.

In English, French, &c. there is no precise mark whereby to distinguish the ablative from other cases; and we only use the term in analogy to the Latin. Thus, in the two phrases, *the magnitude of the city*, and *he spoke much of the city*; we say, that *of the city* in the first is *genitive*, and in the latter *ablative*; because it would be so, if the two phrases were expressed in Latin.

The question concerning the Greek ablative has been the subject of a famous literary war between two great grammarians, Frischlin and Crusius; the former of whom maintained, and the latter opposed the reality of it. The dispute still subsists among their respective followers. The chief reason alledged by the former is, that the Roman writers often joined Greek words with the Latin prepositions, which govern ablative cases, as well as with nouns of the same case. To which their opponents answer, that the Latins anciently had no ablative themselves; but instead thereof, made use, like the Greeks, of the dative case; till at length they formed an ablative, governed by prepositions, which were not put before the dative: that, at first, the two cases had always the same termination, as they still have in many instances: but that this was afterwards changed in certain words. It is no wonder then, that the Latins sometimes join prepositions which govern an ablative case, or nouns in the ablative case, with Greek datives, since they were originally the same; and that the Greek dative has the same effect as the Latin ablative.

ABLE, or abel (Thomas), chaplain to queen Catharine consort to Henry the eighth, distinguished himself by his zeal in opposing the proceedings against that unfortunate princess for a divorce. For this purpose he wrote a piece intitled "*Tractatus de non dissolvendo Henrici et Catherinæ matrimonio*, i. e. A Treatise proving that the marriage of king Henry and queen Catherine ought not to be dissolved." But the title of the book, according to bishop Tanner, was *Invicta Veritas*. He took the degree of Bachelor of Arts at Oxford on the 4th of July 1513, and that of Master of Arts on the 27th of July 1516. In 1534 he fell under a prosecution for being concerned in the affair of Elizabeth Barton, called the *Holy Maid of Kent*. This was an infamous impostor, suborned by the monks to use some strange gesticulations, and to pretend to inspiration by the spirit of prophecy; and so well did she act her part, that some people of consequence gave credit to her: but being at last detected, she was condemned and executed, after discovering the names of her principal accomplices and instigators. On her account Able was accused of misprision of treason, by stat. 25. Hen. VIII.; and being also one of those who denied the king's supremacy over the church, he was apprehended and imprisoned; during which time his confinement was so rigorous, that the keeper of Newgate was committed to Marshalsea prison for suffering him to go out upon bail. He was afterwards hanged, drawn, and quartered, at Smithfield in 1540. Bouchier gives him the character of a very learned man; and tells us, that he used to teach the queen music and the learned languages.

ABLECTI, in Roman antiquity, a select body of soldiers chosen from among those called Extraordinarii.

ABLEGMINA, in Roman antiquity, those choice parts of the entrails of victims which were offered in sacrifice to the gods. They were sprinkled with flour, and burnt upon the altar; the priests pouring some wine on them.

ABLUENTS, in medicine, the same with diluters or Diluents.

ABLUTION, in a general sense, signifies the washing or purifying something with water.

Ablution, in a religious sense, a ceremony in use among the ancients, and still practised in several parts of the world: it consisted in washing the body, which was always done before sacrificing, or even entering their houses.—Ablutions appear to be as old as any ceremonies, and external worship itself. Moses enjoined them; the heathens adopted them; and Mahomet and his followers have continued them: thus they have got footing among most nations, and make a considerable part of most established religions. The Egyptian priests had their diurnal and nocturnal ablutions; the Grecians their sprinklings; the Romans their lustrations and lavations; the Jews their washing of hands and feet, beside their baptisms. The ancient Christians had their ablutions before communion; which the Romish church still retain before their mass, sometimes after: the Syrians, Cophts, &c. have their solemn washings on Good-Friday: the Turks their greater and lesser ablutions; their Ghast and Wodou, their Aman, Taharat, &c.

ABNER, the son of Ner, father-in-law to Saul, and general of all his forces, who served him on all occasions with fidelity and courage. After the death of that prince, Abner set Ishbosheth, Saul's son, on the throne. A war breaking out between the tribe of Judah who had elected David king, and Israel, Abner marched against that prince with the flower of his troops, but was defeated. Abner afterward, being disguised, went over to David, and disposed the chiefs of the army and the elders of Israel to declare for him; and was received by David with such testimonies of affection, as gave umbrage to Joab, who killed him traiterously.

ABNOBA, now ABENOW, a long range of mountains in Germany, taking different names according to the different countries they run through. As about the river Maine, called the *Oden* or *Ottenwald;* between Hesse and Franconia, the *Spessart*; and about the duchy of Wirtemberg, where the Danube takes its rise, called the *Baar*.

ABO, a maritime town in Sweden: it is the capital of the province of Finland, and lies upon the point where the gulphs of Bothnia and Finland unite. It is a good port; and is the see of a bishop, suffragan of Upsal. It has an university, founded by queen Christina in 1640, and endowed with the same privileges as that of *Upsal*. There is also a school here, which was founded by Gustavus Adolphus, for 300 scholars. The town is tolerably well built, and contains several brick buildings; but the generality are of wood painted red. The inhabitants export linen, corn, and planks. It lies 120 miles north-east from Stockholm. E. Long. 21. 28. Lat. 60. 50.

ABOARD, the inside of a ship. Hence any person who enters a ship is said to *go aboard:* but when an enemy enters in the time of battle, he is said to *board*; a phrase which always implies hostility.—To *fall aboard of*, is to strike or *encounter* another ship when one or both are in motion, or to be driven upon a ship by the force of the wind and current.—*Aboard-main-tack*, the order to draw the main-tack, *i. e.* the lower corner of the main-sail, down to the CHESS-TREE.

ABOLITION, implies the act of annulling, destroying, making void, or reducing to nothing. In law, it signifies the repealing any law or statute.

ABOLLA, a warm kind of garment, lined or doubled, worn by the Greeks and Romans, chiefly out of the city, in following the camp.—Critics and antiquaries are greatly divided as to the form, use, kinds, &c. of this garment. Papias makes it a species of the toga, or gown; but Nonius, and the generality, a species of the pallium, or cloak. The *abolla* seems rather to have stood opposed to the *toga*, which was a garment of peace, as the *abolla* was of war; at least Varro and Martial place them in this opposite light. There seem to have been different kinds of Abollas, suited to different occasions. Even kings appear to have used the abolla: Caligula was affronted at king Ptolemy for appearing at the shews in a purple abolla, and by the eclat thereof turning the eyes of the spectators from the emperor upon himself.

ABOMASUS, ABOMASUM, or ABOMASIUS, names of the fourth stomach of ruminating animals. It is in the abomasus of calves and lambs that the runnet or earning is formed wherewith milk is curdled. See COMPARATIVE *Anatomy*.

ABOMINATION, a term used in scripture with regard to the Hebrews, who, being shepherds, are said to have been an abomination to the Egyptians, because they sacrificed the sacred animals of that people, as oxen, goats, sheep, &c. which the Egyptians esteemed as abominations, or things unlawful. The term is also applied in the sacred writings to idolatry and idols, because the worship of idols is in itself an abominable thing, and at the same time ceremonies observed by idolaters were always attended with licentiousness and other odious and abominable actions. The *abomination of desolation* foretold to the prophet Daniel, is supposed to imply the statue of Jupiter Olympius, which Antiochus Epiphanes caused to be placed in the temple of Jerusalem. And the *abomination of desolation*, mentioned by the Evangelists, signifies the ensigns of the Romans, during the last siege of Jerusalem by Titus, on which the figures of their gods and emperors were embroidered, and placed upon the temple after it was taken.

ABON, ABONA, or ABONIS (anc. geog.), a town and river of Albion. The town, according to Camden, is Abingdon; and the river Abhon or Avon. But by Antonine's Itinerary, the distance is nine miles from the Venta Silurum, or Caer-Went: others, therefore, take the town to be Porshut, at the mouth of the river Avon, over against Bristol. Abhon or Avon, in the Celtic language, denotes a river.

ABORIGINES, (Dionysius of Halicarnassus, Livy, Virgil); originally a proper name, given to a certain people in Italy, who inhabited the ancient Latium, or country now called *Campagna di Roma*. In this sense the Aborigines are distinguished from the Janigenæ, who, according to the false Berosus, inhabited the country before them; from the Siculi, whom they expelled; from the Grecians, from whom they descended; from the Latins, whose name they assumed after their union with Æneas and the Trojans; lastly, from the Ausonii, Volsci, Oenotrii, &c. neighbouring nations in other parts of the country. Whence this people came by the appellation, is much disputed. St Jerom says, they were so called, as being, *absque origine*, the primitive planters of the country after the flood: Dion. of Halicarnassus accounts for the name, as denoting them the founders of the race of inhabitants of that country: others think them so called, as being originally Arcadians, who claimed to be earth-born, and not descended from any people. Aurelius Victor suggests another opinion, viz. that they were called *Aborigines*, q. d. *Aberrigines*, from *ab* "from," and *errare* "to wander;" as having been before a wandering people. Pausanias rather thinks they were thus called απο ορεος, from "mountains;" which opinion seems confirmed by Virgil, who, speaking of Saturn, the legislator of this people, says,

Is genus indocile ac dispersum montibus altis
Composuit, legesque dedit.—

The Aborigines were either the original inhabitants of the country, settled there by Janus, as some imagine; or by Saturn, or Cham, as others: not long after the dispersion, or even, as some think, before it: Or they were a colony sent from some other nation; who expelling the ancient inhabitants the Siculi, settled in their place.—About this mother-nation there is great dispute. Some maintain it to be the Arcadians, parties of whom were brought into Italy at different times; the first under the conduct of Oenotrius, son of Lycaon, 450 years before the Trojan war; a second from Thessaly; a third under Evander, 60 years before the Trojan war: besides another under Hercules; and another of Lacedæmonians, who fled from the severe discipline of Lycurgus: all these uniting, are said to have formed the nation or kingdom of the Aborigines. Others will have them of barbarous rather than Grecian origin, and to have come from Scythia; others from Gaul. Lastly, others will have them to be Canaanites, expelled by Joshua.

The term *Aborigines*, though ſo famous in antiquity, is uſed in modern geography only occaſionally as an appellative. It is given to the primitive inhabitants of a country, in contradiſtinction to colonies, or new races of people.

ABORTION, in midwifery, the excluſion of a fœtus before it has acquired a ſufficient degree of perfection to enable it to perform reſpiration and the other vital functions. See MIDWIFERY.

The practice of procuring abortions was prohibited by the ancient Greek legiſlators Solon and Lycurgus. Whether or not it was permitted among the Romans, has been much diſputed. It is certain the practice, which was by them called *viſceribus vim inferre*, was frequent enough: but whether there was any penalty on it, before the emperors Severus and Antonine, is the queſtion. Noodt maintains the negative; and further, that thoſe princes only made it criminal in one particular caſe, viz. of a married woman's practiſing it out of reſentment againſt her huſband, in order to defraud him of the comfort of children: this was ordered to be puniſhed by a temporary exile. The foundation on which the practice is ſaid to have been allowed, was, that the fœtus, while *in utero*, was reputed as a part of the mother, ranked as one of her own viſcera, over which ſhe had the ſame power as over the reſt: beſides, that it was not reputed as a man, *homo*; nor to be alive, otherwiſe than as a vegetable; conſequently, that the crime amounted to little more than that of plucking unripe fruit from the tree. Seneca repreſents it as a peculiar glory of Helvia, that ſhe had never, like other women, whoſe chief ſtudy is their beauty and ſhape, deſtroyed the fœtus in her womb. The primitive fathers, Athenagoras, Tertullian, Minutius Felix, Auguſtin, &c. declaimed loudly againſt the practice as virtual murder. Several councils have condemned it. Yet we are told that the modern Romiſh eccleſiaſtical laws allow of diſpeſations for it. Egane mentions the rates at which a diſpenſation for it may be had.

The practice of artificial abortion is chiefly in the hands of women and nurſes, rarely in that of phyſicians; who, in ſome countries, are not admitted to the profeſſion without abjuring it. Hippocrates, in the oath he would have enjoined on all phyſicians, includes their not giving the *peſſus abortivus*; though elſewhere he gives the formal proceſs whereby he himſelf procured in a young woman a miſcarriage. It may, however, be obſerved, that often all the powers of art prove ineffectual, and no leſs often do the attempts prove the means of puniſhment by the fatal conſequences which they produce.

ABORTION, among gardeners, ſignifies ſuch fruits as are produced too early, and never arrive at maturity.

ABORTIVE, is, in general, applied to whatever comes before its legitimate time, or to any deſign which miſcarries.

Abortive Corn, a diſtemper of corn mentioned by M. Gillet, and ſuſpected to be occaſioned by inſects. It appears long before harveſt, and may be known by a deformity of the ſtalk, the leaves, the ear, and even the grain.

Abortive Vellum is made of the ſkin of an abortive calf.

ABOUKIR, a ſmall town of Egypt, ſituate in the deſart between Alexandria and Roſetta. It is the ancient Canopus, and is ſituated, according to Mr Savary, ſix leagues from Pharos. Pliny ſays, from the teſtimonies of antiquity, that it was formerly an iſland: and its local appearance makes this credible; for the grounds around it are ſo low, that the ſea ſtill covered a part of them in the days of Strabo. The town is built upon a rock, which forms a handſome road for ſhipping, and is out of the reach of inundations. See CANOPUS.

ABOUT, the ſituation of a ſhip immediately after ſhe has *tacked*, or changed her courſe by going about and ſtanding on the other tack.—*About ſhip!* the order to the ſhip's crew to prepare for tacking.

ABOUTIGE, a town in Upper Egypt, in Africa, near the Nile where they make the beſt opium in all the Levant. It was formerly a large, but now is a mean place. N. Lat. 26. 50.

ABRA, a ſilver coin ſtruck in Poland, and worth about one ſhilling Sterling. It is current in ſeveral parts of Germany, Conſtantinople, Aſtracan, Smyrna, and Grand Cairo.

ABRABANEL, ABARBANEL, or AVRAVANEL, (Iſaac), a celebrated rabbi, deſcended from king David, and born at Liſbon A. D. 1437. He became counſellor to Alphonſo V. king of Portugal, and afterwards to Ferdinand the Catholic; but in 1492 was obliged to leave Spain with the other Jews. In ſhort, after reſiding at Naples, Corfu, and ſeveral other cities, he died at Venice in 1508, aged 71. Abrabanel paſſed for one of the moſt learned of the rabbis; and the Jews gave him the names of the Sage, the Prince, and the Great Politician. We have a commentary of his on all the Old Teſtament, which is pretty ſcarce: he there principally adheres to the literal ſenſe; and his ſtile is clear, but a little diffuſe. His other works are, A Treatiſe on the Creation of the World; in which he refutes Ariſtotle, who imagined that the world was eternal; A Treatiſe on the explication of the prophecies relating to the Meſſiah, againſt the Chriſtian: A book concerning articles of Faith; and ſome others leſs ſought after. Though Abrabanel diſcovers his implacable averſion to Chriſtianity in all his writings, yet he treated Chriſtians with politeneſs and good-manners in the common affairs of life.

ABRACADABRA, a magical word, recommended by Serenus Samonicus as an antidote againſt agues and ſeveral other diſeaſes. It was to be written upon a piece of paper as many times as the word contains letters, omitting the laſt letter of the former every time, as in the margin †, and repeated in the ſame order; and then ſuſpended about the neck by a linen thread. *Abracadabra* was the name of a god worſhiped by the Syrians; ſo wearing his name was a ſort of invocation of his aid: a practice which, though not more uſeful, yet was leſs irrational, than is the equally heatheniſh practice among thoſe who call themſelves Chriſtians, of wearing various things, in expectation of their operating by a ſympathy, whoſe parents were Ignorance and Superſtition.

†
abracadabra
abracadabr
abracadab
abracada
abracad
abraca
abrac
abra
abr
ab
a

ABRAHAM, the father and ſtock whence the faithful ſprung, was the ſon of Terah. He was deſcended from Noah by Shem, from whom he was nine degrees removed. Some fix his birth in the 130th year of Terah's age, but others place it in his fathers 70th year. It is highly probable he was born in the city of Ur, in Chaldea, which he and his father left when they went

went to Canaan, where they remained till the death of Terah; after which, Abraham resumed his first design of going to Palestine. The Scriptures mention the several places he stopped at in Canaan; his journey into Egypt, where his wife was carried off from him; his going into Gerar, where Sarah was again taken from him, but restored as before; the victory he obtained over the four kings who had plundered Sodom; his compliance with his wife, who insisted that he should make use of their maid Hagar in order to raise up children; the covenant God made with him, sealed with the ceremony of circumcision; his obedience to the command of God, who ordered him to offer up his only son as a sacrifice, and how that bloody act was prevented; his marriage with Keturah; his death at the age of 175 years: and his interment at the cave of Macpelah, near the body of Sarah his first wife. It would be of little use to dwell long upon these particulars, since they are so well known. But tradition has supplied numberless others, the mention of one or two of which may not be unacceptable.

Many extraordinary particulars have been told relating to his conversion from idolatry. It is a pretty general opinion, that he sucked in the poison with his milk; that his father made statues, and taught that they were to be worshipped as gods*. Some Jewish authors relate†, that Abraham followed the same trade with Terah for a considerable time. Maimonaides‡ says, that he was bred up in the religion of the Sabæans, who acknowledged no deity but the stars; that his reflections on the nature of the planets, his admiration of their motions, beauty, and order, made him conclude there must be a being superior to the machine of the universe, a being who created and governed it: however, according to an old tradition, he did not renounce paganism till the 50th year of his age. It is related§, that his father being gone a journey, left him to sell the statues in his absence; and that a man, who pretended to be a purchaser, asked him how old he was, Abraham answered, "Fifty."—"Wretch that thou art, (said the other), for adoring at such an age, a being which is but a day old?" These words greatly confounded Abraham. Some time afterwards, a woman brought him some flour, that he might give it as an offering to the idols; but Abraham, instead of doing so, took up a hatchet and broke them all to pieces, excepting the largest, into the hand of which he put the weapon. Terah, at his return, asked whence came all this havock? Abraham made answer that the statues had had a great contest which should eat first of the oblation; "Upon which (said he), the god you see there, being the stoutest, hewed the others to pieces with that hatchet." Terah told him this was bantering; for those idols had not the sense to act in this manner. Abraham retorted these words upon his father against the worshipping of such gods. Terah, stung with his raillery, delivered up his son to the cognisance of Nimrod, the sovereign of the country: who exhorted Abraham to worship the fire; and, upon his refusal, commanded him to be thrown into the midst of the flames: "Now let your God (said he) come and deliver you:" But (adds the tradition), Abraham came safe and sound out of the flames.—This tradition is not of modern date, since it is told by St Jerome§; who seems to credit it in general, but disbelieves that part of it which makes Terah so cruel as to be the informer against his own son. Perhaps the ambiguity of the word *Ur** might have given rise to the fiction altogether. Such as lay stress on the following words which God says to Abraham (Gen. xv. 7.), *I am the Lord that brought thee out of Ur of the Chaldees*, imagine that he saved him from a great persecution, since he employed the very same words in the beginning of the decalogue to denote the deliverance from Egypt.

* Suidas, in Ἀβραάμ. See Josh. xxiv. 2.

† Apud Genebrand. in Chron.

‡ More Nevoch. c. 29.

§ Heidegg. Hist. Patriarch. tom. iii. p. 36.

§ Tradit. Hebraic. in Genesin.

* It is the proper names of a city, and it also signified *fire*. The Lat. version Esdras ix, has it thus: *Qui elegisti eum de igne Chaldeorum.*

Abraham is said to have been well skilled in many sciences, and to have wrote several books. Josephus† tells us that he taught the Egyptians arithmetic and geometry; and, according to Eupolemus and Artapan, he instructed the Phœnicians, as well as the Egyptians, in astronomy. A work which treats of the creation has been long ascribed to him; it is mentioned in the Talmud‡, and the Rabbis Chanina, and Hoschia used to read it on the eve before the sabbath. In the first ages of Christianity, according to St Epiphanius §, a heretical sect, called Sethinians, dispersed a piece which had the title of *Abraham's Revelation*. Origen mentions also a treatise supposed to be wrote by this patriarch. All the several works which Abraham composed in the plains of Mamre, are said to be contained in the library of the monastery of the Holy Cross on Mount Amaria, of Ethiopia ¶. The book on the creation was printed at Paris 1552, and translated into Latin by Postel: Rittangel, a converted Jew, and professor at Konigsberg, gave also a Latin translation of it, with remarks, in 1642.

† Antiq. lib. i. cap. 7. 8.

‡ Heidegg. Hist. Patriarch. tom. ii. p. 143.

§ Advers. Hær. p. 286.

¶ Kirchem's treatise of libraries, p. 142.

Abraham Usque, a Portugese Jew, who translated the Bible out of Hebrew into Spanish. It was printed at Ferrara in 1553, and reprinted in Holland in 1630. This Bible, especially the first edition, which is most valuable, is marked with stars at certain words, which are designed to show that the words are difficult to be understood in the Hebrew, and that they may be used in a different sense.

Abraham (Nicholas), a learned Jesuit born in the diocese of Toul, in Lorrain, in 1589. He obtained the rank of divinity professor in the university of Pont-a-Mouson, which he enjoyed 17 years, and died September 7, 1655. He wrote Notes on Virgil and on Nonnius; a Commentary on some of Cicero's Orations, in 2 vols folio: an excellent collection of theological pieces, in folio, intitled *Pharus Veteris Testamenti*; and some other works.

ABRAHAMITES, an order of monks exterminated for idolatry by Theophilus in the ninth century. Also the name of another sect of heretics who had adopted the errors of Paulus. See Paulicians.

ABRANTES, a town of Portugal, in Estremadura, seated on the river Tajo, belongs to a marquis of the same name. It stands high, is surrounded with gardens and olive-trees, and contains thirty-five thousand inhabitants. It has four convents, an alms-house, and an hospital. W. Long. 7. 18. Lat. 39, 13.

ABRASAX, or Abraxas, the supreme god of the Basilidian heretics. It is a mystical word, composed of the Greek numerals α, β, ρ, α, ξ, α, ς, which together make up the number CCCLXV. For Basilides taught that there were 365 heavens between the earth and the empyrean: each of which heavens had its angel or intelligence, which created it; each of which angels likewise

wiſe was created by the angel next above it; thus aſcending by a ſcale to the ſupreme Being, or firſt creator. The Baſilidians uſed the word *Abraxas* by way of charm or amulet.

ABRASION, is ſometimes uſed among medicinal writers, for the effect of ſharp corroſive medicines, or humours in wearing away the natural mucus which covers the membranes, and particularly thoſe of the ſtomach and inteſtines. The word is compoſed of the Latin *ab* and *rado* to *ſhave* or *ſcrape off*.

ABRAVANNUS (anc. geog.) the name of a promontory and river of Galloway, in Scotland, ſo called from the Celtic terms *Eber*, ſignifying either the mouth of a river, or the confluence of two rivers, and *Avon*, a river.

ABRAUM, in natural hiſtory, a name given by ſome writers to a ſpecies of red clay uſed in England by the cabinet makers, &c. to give a red colour to new mahogany wood. We have it from the iſle of Wight; but it is alſo found in Germany and Italy.

ABRAXAS, an antique ſtone with the word *abraxas* engraven on it. They are of various ſizes, and moſt of them as old as the third century. They are frequent in the cabinets of the curious; and a collection of them, as complete as poſſible, has been deſired by ſeveral. There is a fine one in the abbey of St Genevieve, which has occaſioned much ſpeculation. Moſt of them ſeem to have come from Egypt; whence they are of ſome uſe for explaining the antiquities of that country. Sometimes they have no other inſcription beſides the word: but others have the names of ſaints, angels, or Jehovah himſelf annexed; though moſt uſually the name of the Baſilidian god. Sometimes there is a repreſentation of Iſis ſitting on a lobes, or apis, ſurrounded with ſtars; ſometimes monſtrous compoſitions of animals, obſcene images, Phalli and Ithyſalli. The graving is rarely good, but the word on the reverſe is ſometimes ſaid to be in a more modern taſte than the other. The characters are uſually Greek, Hebrew, Coptic, or Hetnerian, and ſometimes of a mongrel kind, invented, as it would ſeem, to render their meaning the more inſcrutable. It is diſputed whether the Veronica of Montreuil, or the granite obeliſk mentioned by Gori, be *Abraxaſes*.

ABREAST (a ſea-term), ſide by ſide, or oppoſite to; a ſituation in which two or more ſhips lie, with their ſides parallel to each other, and their heads equally advanced. This term more particularly regards the line of battle at ſea, where, on different occaſions of attack, retreat, or purſuit, the ſeveral ſquadrons or diviſions of a fleet are obliged to vary their diſpoſitions, and yet maintain a proper regularity by ſailing in right or curved lines. When the line is formed *abreaſt*, the whole ſquadron advances uniformly, the ſhips being equally diſtant from and parallel to each other, ſo that the length of each ſhip forms a right angle with the extent of the ſquadron or line abreaſt. The commander in chief is always ſtationed in the centre, and the ſecond and third in command in the centre of their reſpective ſquadrons.—*Abreaſt*, within the ſhip, implies on a line with the beam, or by the ſide of any object aboard; as, the frigate ſprung a leak *abreaſt* of the main-hatch-way, *i. e.* on the ſame line with the main hatch-way, croſſing the ſhip's length at right angles, in oppoſition to AFORE or ABAFT the hatch-way.—We diſcovered a fleet *abreaſt* of Beachy-head; *i. e.* off, or directly oppoſite to it.

ABRETTENE, or ABRETTINE (anc. geog.), a diſtrict of Myſia, in Aſia. Hence the epithet *Abrettenus* given to Jupiter (Strabo); whoſe prieſt was Cleon, formerly at the head of a gang of robbers, and who received many and great favours at the hand of Antony, but afterwards went over to Auguſtus. The people were called *Abretteni*; inhabiting the country between Ancyra of Phrygia, and the river Rhyndacus.

ABRIDGEMENT, in literature, a term ſignifying the reduction of a book into a ſmaller compaſs.

The art of conveying much ſentiment in few words, is the happieſt talent an author can be poſſeſſed of. This talent is peculiarly neceſſary in the preſent ſtate of literature; for many writers have acquired the dexterity of ſpreading a few tritical thoughts over ſeveral hundred pages. When an author hits upon a thought that pleaſes him, he is apt to dwell upon it, to view it in different lights, to force it in improperly, or upon the ſlighteſt relations. Though this may be pleaſant to the writers, it tires and vexes the reader. There is another great ſource of diffuſion in compoſition. It is a capital object with an author, whatever be the ſubject, to give vent to all his beſt thoughts. When he finds a proper place for any of them, he is peculiarly happy. But, rather than ſacrifice a thought he is fond of, he forces it in by way of digreſſion, or ſuperfluous illuſtration. If none of theſe expedients anſwer his purpoſe, he has recourſe to the margin, a very convenient apartment for all manner of pedantry and impertinence. There is not an author, however correct, but is more or leſs faulty in this reſpect. An abridger, however, is not ſubject to theſe temptations. The thoughts are not his own; he views them in a cooler and leſs affectionate manner; he diſcovers an impropriety in ſome, a vanity in others, and a want of utility in many. His buſineſs, therefore, is to retrench ſuperfluities, digreſſions, quotations, pedantry, &c. and to lay before the public only what is really uſeful. This is by no means an eaſy employment: To abridge ſome books, requires talents equal, if not ſuperior, to thoſe of the author. The facts, manner, ſpirit, and reaſoning, muſt be preſerved; nothing eſſential, either in argument or illuſtration ought to be omitted. The difficulty of the taſk is the principal reaſon why we have ſo few good abridgements: Wynne's abridgment of Locke's Eſſay on the Human Underſtanding, is, perhaps, the only unexceptionable one in our language.

Theſe obſervations relate ſolely to ſuch abridgements as are deſigned for the public. But,

When a perſon wants to ſet down the ſubſtance of any book, a ſhorter and leſs laborious method may be followed. It would be foreign to our plan to give examples of abridgements for the public: But as it may be uſeful, eſpecially to young people, to know how to abridge books for their own uſe after giving a few directions, we ſhall exhibit an example or two, or ſhow with what eaſe it may be done.

Read the book carefully; endeavour to learn the principal view of the author, attend to the arguments employed: When you have done ſo, you will generally find, that what the author uſes as new or additional arguments, are in reality only collateral ones, or extenſions of the principal argument. Take a piece of

Abridgement.

paper or a common-place book, put down what the author wants to prove, subjoin the argument or arguments, and you have the ſubſtance of the book in a few lines. For example,

In the Eſſay on Miracles, Mr Hume's deſign is to prove, That miracles which have not been the immediate objects of our ſenſes, cannot reaſonably be believed upon the teſtimony of others.

Now, his argument (for there happens to be but one) is,

"That experience, which in ſome things is variable, "in others uniform, is our *only* guide in reaſoning "concerning matters of fact. A variable experience "gives riſe to probability only; an uniform experi-"ence amounts to a proof. Our belief of any fact "from the teſtimony of eye-witneſſes is derived from "no other principle than our experience in the vera-"city of human teſtimony. If the fact atteſted be "miraculous, here ariſes a conteſt of two oppoſite ex-"periences, or proof againſt proof. Now, a miracle "is a violation of the laws of nature; and as a firm and "unalterable experience has eſtabliſhed theſe laws, the "proof againſt a miracle, from the very nature of the "fact, is as complete as any argument from experi-"ence can poſſibly be imagined; and if ſo, it is an un-"deniable conſequence, that it cannot be ſurmounted by "any proof whatever derived from human teſtimony."

In Dr Campbell's Diſſertation on Miracles, the author's principal aim is to ſhew the fallacy of Mr Hume's argument; which he has done moſt ſucceſsfully by another ſingle argument, as follows:

"The evidence ariſing from human teſtimony *is not* "*ſolely* derived from experience: on the contrary, te-"ſtimony hath a natural influence on belief antece-"dent to experience. The early and unlimited aſſent "given to teſtimony by children gradually contracts "as they advance in life: it is, therefore, more con-"ſonant to truth, to ſay, that our *diffidence* in teſtimo-"ny is the reſult of experience, than that our *faith* in "it has this foundation. Beſides, the uniformity of "experience, in favour of any fact, is not a proof a-"gainſt its being reverſed in a particular inſtance. "The evidence ariſing from the ſingle teſtimony of a "man of known veracity will go farther to eſtabliſh a "belief in its being actually reverſed: If his teſtimo-"ny be confirmed by a few others of the ſame charac-"ter, we cannot with-hold our aſſent to the truth of it. "Now, though the operations of nature are governed "by uniform laws, and though we have not the teſti-"mony of our ſenſes in favour of any *violation* of "them; ſtill, if in particular inſtances we have the "teſtimony of *thouſands* of our fellow-creatures, and "thoſe too, men of ſtrict integrity, ſwayed by no mo-"tives of ambition or intereſt, and governed by the "principles of common-ſenſe, That they were actu-"ally eye-witneſſes of theſe violations, the conſtitu-"tion of our nature obliges us to believe them."

Theſe two examples contain the ſubſtance of about 400 pages.——Making private abridgements of this kind has many advantages; it engages us to read with accuracy and attention; it fixes the ſubject in our minds; and, if we ſhould happen to forget, inſtead of reading the book again, by glancing a few lines we are not only in poſſeſſion of the chief arguments, but recal in a good meaſure the author's method and manner.

Abridging is peculiarly uſeful in taking the ſubſtance of what is delivered by Profeſſors, &c. It is impoſſible, even with the aſſiſtance of ſhort-hand, to take down, *verbatim*, what is ſaid by a public ſpeaker. Beſides, although it were practicable, ſuch a talent would be of little uſe. Every public ſpeaker has circumlocutions, redundancies, lumber, which deſerve not to be copied. All that is really uſeful may be comprehended in a ſhort compaſs. If the plan of the diſcourſe, and arguments employed in ſupport of the different branches, be taken down, you have the whole. Theſe you may afterwards extend in the form of a diſcourſe dreſſed in your own language. This would not only be a more rational employment, but would likewiſe be an excellent method of improving young men in compoſition; an object too little attended to in all ſeminaries of learning.

Abrincatarum ‖ Abruzzo.

ABRINCATARUM OPPIDUM (anc. geog.), the town of the *Abrincatæ* or *Abrincatui*, now *Avranches*, in France, ſituated on an eminence in the ſouth-weſt of Normandy near the borders of Brittany on the Engliſh channel. W. Long. 1. 10. N. Lat. 48. 40.

ABROGATION, the act of aboliſhing a law, by authority of the maker; in which ſenſe the word is ſynonymous with abolition, repealing, and revocation.

Abrogation ſtands oppoſed to *rogation:* it is diſtinguiſhed from *derogation*, which implies the taking away only ſome part of a law; from *ſubrogation*, which denotes the adding a clauſe to it; from *obrogation*, which implies the limiting or reſtraining it; from *diſpenſation*, which only ſets it aſide in a particular inſtance; and from *antiquation*, which is the refuſing to paſs a law.

ABROKANI, or MALLEMOLLI, a kind of muſlin, or clear white fine cotton cloth, brought from the Eaſt Indies, particularly from Bengal; being in length 16 French ells and 3 quarters, and in breadth 5 eighths.

ABROLKOS, the name of certain ſhelves, or banks of ſand, about 20 leagues from the coaſt of Brazil.

ABROTANUM, in botany. See ARTEMISIA and SANTOLINA.

ABROTONUM (anc. geog.), a town and harbour on the Mediterranean, in the diſtrict of Syrtis Parva, in Africa, one of the three cities that went to form Tripoly.

ABRUS, in botany, the trivial name of the GLYCINE.

ABRUZZO, a province in Naples. The river Peſcara divides it into two parts; one of which is called Ulterior, whereof Aquila is the capital; and the other Citerior, whoſe capital is Soromona. Beſides the Appenines, there are two conſiderable mountains, the one called Monte Cavallo, and the other Monte Maiello; the top of which laſt is always covered with ſnow. Abruzzo is a cold country; but the rigour of the climate is not ſo great as to prevent the country from producing in abundance every thing requiſite for the ſupport of life. Vegetables, fruits, animals, and numberleſs other articles of ſuſtenance, not only furniſh ample proviſion for the uſe of the natives, but alſo allow of exportation. There is ſo large a quantity of wheat reaped, that many thouſands of quarters are annually ſhipped off. Much Turkey wheat is ſent out, and the province of Teramo ſells a great deal of rice little inferior in goodneſs to that of Lombardy. Oil is a plentiful commodity, and wines are made for exportation on many parts of the coaſt; but wool has always been, and ſtill is, their ſtaple commodity: the flocks, after paſſing the whole ſummer in the fine paſtures of the mountains, are driven for the winter into the warm plains of Puglia, and a few ſpots near their own coaſt, where the ſnow does not lie; there are no manufactures of woollens in the province, except two ſmall ones of coarſe cloth, and the greateſt part of the wool is ſent out unwrought. No ſilk is made here, though mulberry-trees would grow well in the low grounds.

Formerly the territory of Aquila furniſhed Italy almoſt excluſively with ſaffron; but ſince the culture of that plant has been ſo much followed in Lombardy, it has fallen to nothing in Abruzzo. In the maritime tracks of the country the cultivation of liquorice has been increaſed of late years, but foreigners export the roots in their natural ſtate: in the province of Teramo there is a manufactory of pottery-ware, for which there is a great demand in Germany, by the way of Trieſte, as it is remarkably hard and fine; but even this is going to decay, by being abandoned entirely to the ignorance of common workmen. It is not to be expected that any improvements will be made in arts and manufactures, where the encouragement and attention of ſuperiors is wanting, and no pains taken to render the commodity more marketable, or to open better channels of ſale for it. The only advantages theſe provinces enjoy, are the gift of benevolent nature; but ſhe has ſtill greater preſents in ſtore for them, and waits only for the helping hand of government to produce them. This whole coaſt, one hundred miles in length, is utterly deſtitute of ſea-ports; and the only ſpots where the produce can be embarked are dangerous inconvenient roads, at the mouths of rivers, and along a lee-ſhore: the difficulty of procuring ſhipping, and of loading the goods, frequently cauſes great quantities of them to rot on hand: which damps induſtry, and prevents all improvements in agriculture. The huſbandman is a poor diſpirited wretch, and wretchedneſs produces emigration: the uneven ſurface of the country occaſions it to be inhabited by retail, if the expreſſion may be uſed, rather than in large maſſes; for there is not a city that contains ten thouſand people, and the moſt of them would find it difficult to muſter three thouſand. Villages, caſtles, and feudatory eſtates, are to be met with in abundance; but the numbers of their inhabitants are to be reckoned by hundreds, not thouſands: in a word, the political and ſocial ſyſtem of the province ſhows no ſigns of the vigour which nature ſo remarkably diſplays here in all her operations.

The antiquary and the naturaliſt may travel here with exquiſite pleaſure and profit; the former will find treaſures of inſcriptions, and inedited monuments appertaining to the warlike nations that once covered the face of the country; the natural philoſopher will have a noble field for obſervation in the ſtupendous monuments that ariſe on all ſides. Monte-corno and Majella are among the moſt intereſting; the firſt is like an aged monument of nature, bald, and horribly broken on every aſpect: from various appearances, it is evident that its bowels contain many valuable veins of metallic ore; but the great difficulty of acceſs renders the ſearch of them almoſt impracticable. Majella has other merits, and of a gayer kind:—nature has clothed its declivities and elevated fields with an infinite variety of her moſt precious plants; vulnerary herbs grow there in as great perfection as on the Alps of Swiſſerland, and are applied by the natives to wounds with equal ſucceſs.

The character of the inhabitants varies a little among themſelves, according to ſituation and climate, but eſſentially from the diſpoſition of the natives of the more ſouthern provinces. This proceeds from a difference of origin: for the Lombards, who were barbarians, but not cruel; poor, but hoſpitable; endowed with plain honeſt ſenſe, though poſſeſſed of little acuteneſs or ſubtlety; remained peaceable proprietors of theſe mountianous regions, till the Normans, who were accuſtomed to a ſimilar climate, came, and diſpoſſeſſed them. The Greeks, who retained almoſt every other part of the kingdom under their dominion, never had any ſway here. For this reaſon the Abruzzeſi ſtill bear a great reſemblance to their northern progenitors or maſters: to this day, one may trace in them the ſame goodneſs of heart, but great indolence, and repugnance to lively exertions; a fault that proceeds rather from a want of active virtue, than a diſpoſition to wickedneſs. Hence it comes that in theſe provinces, where the proximity of the frontier almoſt inſures impunity, fewer atrocious and inhuman deeds are heard of than in other parts of the realm. Remnants of ancient northern cuſtoms exiſted here ſo late as the beginning of this century, and, among the mountaineers, very evident traces of the Frank and Teutonic languages may be diſcovered.

ABSALOM, the ſon of David by Maacah, was brother to Thamar, David's daughter, who was raviſhed by Amnon their eldeſt brother by another mother. Abſalom waited two years for an opportunity of revenging the injury done to his ſiſter; and at laſt procured the aſſaſſination of Amnon at a feaſt which he had prepared for the king's ſons. He took refuge with Talmai king of Geſher; and was no ſooner reſtored to favour, but he engaged the Iſraelites to revolt from his father. Abſalom was defeated in the wood of Ephraim: as he was flying, his hair caught hold of an oak, where he hung till Joab came and thurſt him through with three darts: David had expreſsly ordered his life to be ſpared, and extremely lamented him.

ABSCESS, in ſurgery; from *abſcedo*, to depart. A cavity containing pus; or, a gathering of matter in a part: So called, becauſe the parts which were joined are now ſeparated; one part recedes from another, to make way for the collected matter. See SURGERY.

ABSCISSE, in conics, a part of the diameter or tranſverſe axis of a conic ſection intercepted between the vertex or ſome other fixed point and a ſemiordinate. See *Conic Sections*.

ABSCONSA, a dark lanthern uſed by the monks at the ceremony of burying their dead.

ABSENCE, in Scots law: When a perſon cited before a court does not appear, and judgment is pronounced, that judgment is ſaid to be *in abſence*. No perſon can be tried criminally in abſence.

ABSINTHIATED, any thing tinged or impregnated with abſinthium or wormwood. Bartholin mentions a woman whoſe milk was become abſinthiated, and rendered as bitter as gall, by the too liberal uſe of wormwood.

Vinum abſinthites, or *poculum abſinthiatum*, "wormwood wine," is much ſpoke of among the ancients as a whole-

wholeſome drink, and even an antidote againſt drunkenneſs, though ſome have charged it with being offenſive to the head, and liable to cauſe fevers, cephalalgias, vomitings, uterine fluxes, &c. Ray alſo makes it a preventative of venery. According to the common opinion, it is made by infuſing the leaves of the plant in wine; but, according to Fehr, it ought to be prepared by fermentation, in order to correct the crudities, and call forth a volatile ſalt; which laſt, however, does not exiſt in wormwood. Some prefer the diſtilled water; but whatever virtues wormwood poſſeſſes reſide entirely in its eſſential oil.

ABSINTHIUM, in botany, the trivial name of the common wormwood. See the article ARTEMISIA.

ABSIS, in aſtronomy, the ſame with apſis. See APSIS.

ABSOLUTE, in a general ſenſe, ſomething that ſtands free or independent.

ABSOLUTE is more particularly underſtood of a being or thing which does not proceed from any cauſe, or does not ſubſiſt by virtue of any other being, conſidered as its cauſe; in which ſenſe, God alone is *abſolute*. *Abſolute*, in this ſenſe, is ſynonymous with *independent*, and ſtands oppoſed to *dependent*.

ABSOLUTE alſo denotes a thing's being free from conditions or limitations; in which ſenſe, the word is ſynonymous with *unconditional*. We ſay, an *abſolute* decree, *abſolute* promiſe, *abſolute* obedience.

ABSOLUTE Government, that wherein the prince is left ſolely to his own will, being not limited to the obſervance of any laws except thoſe of his own diſcretion.

ABSOLUTE Equation, in aſtronomy, is the aggregate of the optic and eccentric equations. The apparent inequality of a planet's motion ariſing from its not being equally diſtant from the earth at all times, is called its optic equation, and would ſubſiſt even if the planet's real motion were uniform. The eccentric inequality is cauſed by the planet's motion being uniform. To illuſtrate which, conceive the ſun to move, or to appear to move, in the circumference of a circle, in whoſe centre the earth is placed. It is manifeſt, that if the ſun moves uniformly in this circle, it muſt appear to move uniformly to a ſpectator on the earth, and in this caſe there will be no optic nor eccentric equation: but ſuppoſe the earth to be placed out of the centre of the circle, and then, though the ſun's motion ſhould be really uniform, it would not appear to be ſo, being ſeen from the earth; and in this caſe there would be an optic equation, without an eccentric one. Imagine farther, the ſun's orbit to be not circular, but elliptic, and the earth in its focus; it will be as evident that the ſun cannot appear to have an uniform motion in ſuch ellipſe: ſo that his motion will then be ſubject to two equations, the optic and the eccentric.

ABSOLUTE Number, in algebra, is any pure number ſtanding in any equation without the conjunction of literal characters; as $2x+36=48$; where 36 and 48 are abſolute numbers, but 2 is not, as being joined with the letter x.

ABSOLUTION, in civil law, is a ſentence whereby the party accuſed is declared innocent of the crime laid to his charge.—Among the Romans, the ordinary method of pronouncing judgment was this: after the cauſe had been pleaded on both ſides, the præco uſed the word *dixerunt*, q. d. they have ſaid what they had to ſay; then three ballots were diſtributed to each judge, marked as mentioned under the article A; and as the majority fell of either mark, the accuſed was *abſolved* or condemned, &c. If he were abſolved, the prætor diſmiſſed him with *videtur non feciſſe*, or *jure videtur feciſſe*.

ABSOLUTION, in the canon law, is a juridical act, whereby the prieſt declares the ſins of ſuch as are penitent remitted.—The Romaniſts hold abſolution a part of the ſacrament of penance: the council of Trent, ſeſſ. xiv. cap. iii. and that of Florence, in the decree *ad Armenos*, declare the form or eſſence of the ſacrament to lie in the words of *abſolution*, I abſolve thee of thy ſins. The *formula* of abſolution, in the Romiſh church, is abſolute: in the Greek church it is deprecatory; and in the churches of the reformed, declarative.

ABSOLUTION is chiefly uſed among proteſtants for a ſentence whereby a perſon who ſtands excommunicated is releaſed or freed from that puniſhment.

ABSORBENT, in general, any thing poſſeſſing the faculty of *abſorbing*, or ſwallowing up another.

ABSORBENT Medicines, teſtaceous powders, as chalk, crab-eyes, &c. which are taken inwardly for drying up or abſorbing any acid or redundant humours in the ſtomach or inteſtines. They are likewiſe applied outwardly to ulcers or ſores with the ſame intention.

ABSORBENT Veſſels, a name given promiſcuouſly to the lacteal veſſels, lymphatics, and inhalent arteries. See ANATOMY.

Naturaliſts ſpeak of the like abſorbents in plants, the fibrous or hairy roots of which are as a kind of vaſa abſorbentia, which attract and imbibe the nutritious juices from the earth. See PLANTS.

ABSORBING, the ſwallowing up, ſucking up, or imbibing any thing: thus black bodies are ſaid to abſorb the rays of light; luxuriant branches, to abſorb or waſte the nutricious juices which ſhould feed the fruit of trees, &c.

ABSORPTION, in the animal œconomy, is the power whereby the abſorbent veſſels imbibe the juices, &c.

ABSORPTIONS of the Earth, a term uſed by Kircher and others for the ſinking in of large tracts of land by means of ſubterraneous commotions, and many other accidents.

Pliny tells us, that in his time the mountain Cymbotus, with the town of Eurites, which ſtood on its ſide, were wholly abſorbed into the earth, ſo that not the leaſt trace of either remained; and he records the like fate of the city Tantalis in Magneſia, and after it of the mountain Sypelus, both thus abſorbed by a violent opening of the earth. Galanis and Garnatus, towns once famous in Phœnicia, are recorded to have met the ſame fate; and the vaſt promontory, called *Phlegium*, in Ethiopia, after a violent earthqaake in the night-time, was not to be ſeen in the morning, the whole having diſappeared, and the earth cloſed over it. Theſe and many other hiſtories, atteſted by the authors of greateſt credit among the ancients, abundantly prove the fact in the earlier ages; and there have not been wanting too many inſtances of more modern date. *Kircher's Mnnd. Subter*. p. 77. See EARTH and EARTHQUAKE.

ABSORUS, Apsorus, Absyrtis, Absyrtides, Apsyrtides, Apsyrtis, and Absyrtium, (Strabo, Mela, Ptolemy;) islands in the Adriatic, in the gulph of Carnero; so called from Absyrtis, Medea's brother, there slain. They are either one island, or two, separated by a narrow channel, and joined by a bridge; and are now called *Cherso* and *Osero*.

ABSTEMII, in church history, a name given to such persons as could not partake of the cup of the eucharist on account of their natural aversion to wine. Calvinists allow these to communicate in the species of bread only, touching the cup with their lip; which, on the other hand, is by the Lutherans deemed a profanation.

ABSTEMIOUS, is properly understood of a person who refrains absolutely from all use of wine.

The history of Mr Wood, in the Medic. Transf. vol. ii. p. 261. art. 18. is a very remarkable exemplification of the very beneficial alterations which may be effected on the human body by a strict course of abstemiousness.

The Roman ladies, in the first ages of the republic, were all enjoined to be abstemious; and that it might appear, by their breath, whether or no they kept up to the injunction, it was one of the laws of the Roman civility, that they should kiss their friends and relations whenever they accosted them.

ABSTEMIUS (Laurentius), a native of Macerata, professor of belles lettres in Urbino, and librarian of duke Guido Ubaldo, under the pontificate of Alexander VI. He wrote, 1. Notes on most difficult passages of ancient authors. 2. Hecatomythium, *i. e.* A collection of an 100 fables, &c. which have been often printed with those of Æsop, Phædrus, Gabrias, Avienus, &c.

ABSTERGENT medicines, those employed for resolving obstructions, concretions, &c. such as soap, &c.

ABSTINENCE, in a general sense, the act or habit of refraining from something which we have a propension to or find pleasure in.—Among the Jews, various kinds of abstinence were ordained by their law. Among the primitive Christians, some denied themselves the use of such meats as were prohibited by that law, others looked upon this abstinence with contempt; as to which, St Paul gives his opinion, Rom. xiv. 1—3. The council of Jerusalem, which was held by the Apostles, enjoined the Christian converts to abstain from meats strangled, from blood, from fornication, and from idolatry. Abstinence, as prescribed by the gospel, is intended to mortify and restrain the passions, to humble our vicious natures, and by that means raise our minds to a due sense of devotion. But there is another sort of abstinence, which may be called *ritual*, and consists in abstaining from particular meats at certain times and seasons. It was the spiritual monarchy of the western world which first introduced this ritual abstinence; the rules of which were called *rogations;* but grossly abused from the true nature and design of fasting.—In England, abstinence from flesh has been enjoined by statute even since the reformation, particularly on Fridays and Saturdays, on vigils, and on all commonly called *fish-days*. The like injunctions were renewed under Q. Elizabeth: but at the same time it was declared, that this was done not out of motives of religion, as if there were any difference in meats; but in favour of the consumption of fish, and to multiply the number of fishermen and mariners, as well as spare the flock of sheep. The great fast, says St Augustin, is to abstain from sin.

Abstinence is more particularly used for a spare diet, or a slender parsimonious use of food, below the ordinary standard of nature. The physicians relate wonders of the effects of abstinence in the cure of many disorders, and protracting the term of life. The noble Venetian, Cornaro, after all imaginable means had proved vain, so that his life was despaired of at 40, recovered, and lived to near 100, by mere dint of abstinence; as he himself gives the account. It is indeed surprising to what a great age the primitive Christians of the east, who retired from the persecutions into the desarts of Arabia and Egypt, lived, healthful and cheerful, on a very little food. Cassian assures us, that the common rate for 24 hours was 12 ounces of bread, and mere water: with this St Anthony lived 105 years; James the Hermit 104; Arsenius, tutor of the Emperor Arcadius, 120; S. Epiphanius, 115; Simeon the Stylite, 112; and Romauld, 120. Buchanan writes, that in Scotland one Laurence preserved himself to 140 by force of temperance and labour; and Spotswood mentions one Kentigern, afterwards called S. Mongah or Mungo, who lived to 185 by the same means. Other instances see under the article Longevity.

Abstinence, however, is to be recommended only as it means a proper regimen; for in general it must have bad consequences when observed without a due regard to constitution, age, strength, *&c.* According to Dr Cheyne, most of the chronical diseases, the infirmities of old age, and the short lives of Englishmen, are owing to repletion; and may be either cured, prevented, or remedied by abstinence: but then the kinds of abstinence which ought to obtain, either in sickness or health, are to be deduced from the laws of diet and regimen.

Among the brute creation, we see extraordinary instances of long abstinence. The serpent-kind, in particular, bear abstinence to a wonderful degree. We have seen rattle-snakes that had subsisted many months without any food, yet still retained their vigour and fierceness. Dr Shaw speaks of a couple of cerastes, (a sort of Egyptian serpents), which had been kept five years in a bottle close corked, without any sort of food, unless a small quantity of sand wherein they coiled themselves up in the bottom of the vessel may be reckoned as such: yet when he saw them, they had newly cast their skins, and were as brisk and lively as if just taken. But it is even natural for divers species to pass four, five, or six months every year, without either eating or drinking. Accordingly, the tortoise, bear, dormouse, serpent, *&c.* are observed regularly to retire, at those seasons, to their respective cells, and hide themselves, some in the caverns of rocks or ruins; others dig holes under ground; others get into woods, and lay themselves up in the clefts of trees; others bury themselves under water, *&c.* And these animals are found as fat and fleshy after some months abstinence as before.—Sir G. Ent* weighed his tortoise several years successively, at its going to earth in October, and coming out again in March; and found, that, of four pounds, four ounces, it only used to lose about one ounce.—Indeed, we have instances of men passing several months

* *Phil. Transf.* n° 194.

months as ſtrictly abſtinent as other creatures. In particular, the records of the Tower of London mention a Scotchman impriſoned for felony, and ſtrictly watched in that fortreſs for ſix weeks: in all which time he took not the leaſt ſuſtenance: for which he had his pardon. Numberleſs inſtances of extroardinary abſtinence, particularly from morbid cauſes, are to be found in the different periodical Memoirs, Tranſactions, Ephemerides, &c.—It is to be added, that, in moſt inſtances of extraordinary human abſtinence related by naturaliſts, there were ſaid to have been apparent marks of a texture of blood and humours, much like that of the animals abovementioned. Though it is no improbable opinion, that the air itſelf may furniſh ſomething for nutrition. It is certain, there are ſubſtances of all kinds, animal, vegetable, &c. floating in the atmoſphere, which muſt be continually taken in by reſpiration. And that an animal body may be nouriſhed thereby, is evident in the inſtance of vipers; which if taken when firſt brought forth, and kept from every thing but air, will yet grow very conſiderably in a few days. So the eggs of lizards are obſerved to increaſe in bulk, after they are produced though there be nothing to furniſh the increment but air alone; in like manner as the eggs or ſpawn of fiſhes grow and are nouriſhed with the water. And hence, ſay ſome, it is that cooks, turnſpit-dogs, &c. though they eat but little, yet are uſually fat. See Fasting.

ABSTINENTS, or Abstinentes, a ſet of heretics that appeared in France and Spain about the end of the third century. They are ſuppoſed to have borrowed part of their opinions from the Gnoſtics and Manicheans, becauſe they oppoſed marriage, condemned the uſe of fleſh meat, and placed the Holy Ghoſt in the claſs of created beings. We have, however, no certain account of their peculiar tenets.

ABSTRACT, in a general ſenſe, any thing ſeparated from ſomething elſe,

Abstract Idea, in metaphyſics, is a partial idea of a complex object, limited to one or more of the component parts or properties, laying aſide or abſtracting from the reſt. Thus, in viewing an object with the eye, or recollecting it in the mind, we can eaſily abſtract from ſome of its parts or properties, and attach ourſelves to others: we can attend to the redneſs of a cherry, without regard to its figure, taſte, or conſiſtence. See Abstraction.

Abstract Terms, words that are uſed to expreſs abſtract ideas. Thus beauty, uglineſs, whiteneſs, roundneſs, life, death, are abſtract terms.

Abstract Numbers, are aſſemblages of units, conſidered in themſelves without denoting any particular and determined particulars. Thus 6 is an abſtract number, when not applied to any thing; but, if we ſay 6 feet, 6 becomes a concrete number. See the article Number.

Abstract Mathematics, otherwiſe called *Pure Mathematics*, is that which treats of magnitude or quantity, abſolutely and generally conſidered, without reſtriction to any ſpecies of particular magnitude; ſuch are Arithmetic and Geometry. In this ſenſe, abſtract mathematics is oppoſed to mixed mathematics; wherein ſimple and abſtract properties, and the relations of quantities primitively conſidered in pure mathematics, are applied to ſenſible objects, and by that means become intermixed with phyſical conſiderations; ſuch are Hydroſtatics, Optics, Navigation, &c.

Abstract, in literature, a compendious view of any large work; ſhorter and more ſuperficial than an abridgment.

ABSTRACTION, in general, the act of abſtracting, or the ſtate of being abſtracted.

Abstraction, in metaphyſics, the operation of the mind when occupied by abſtract ideas. A large oak fixes our attention, and abſtracts us from the ſhrubs that ſurround it. In the ſame manner, a beautiful woman in a crowd, abſtracts our thoughts, and engroſſes our attention ſolely to herſelf. Theſe are examples of real abſtraction: when theſe, or any others of a ſimilar kind, are recalled to the mind after the objects themſelves are removed from our ſight, they form what are called *abſtract ideas*, or the mind is ſaid to be employed in abſtract ideas. But the power of abſtraction is not confined to objects that are ſeparable in reality as well as mentally: the ſize, the figure, the colour of a tree are inſeparably connected, and cannot exiſt independent of each other; and yet we can mentally confine our obſervations to any one of theſe properties, neglecting or abſtracting from the reſt.

Abſtraction is chiefly employed theſe three ways. Firſt, When the mind conſiders any one part of a thing, in ſome reſpect diſtinct from the whole; as a man's arm, without the conſideration of the reſt of the body. Secondly, When we conſider the *mode* of any ſubſtance, omitting the ſubſtance itſelf; or when we ſeparately conſider ſeveral modes which ſubſiſt together in one ſubject. This abſtraction the geometricians make uſe of when they conſider the length of a body ſeparately, which they call *a line*, omitting the conſideration of its breadth and thickneſs. Thirdly, It is by abſtraction that the mind forms general or univerſal ideas; omitting the modes and relations of the particular objects whence they are formed. Thus, when we ſhould underſtand a thinking being in general, we gather from our ſelf-conſciouſneſs what it is to think; and, omitting thoſe things which have a particular relation to our own minds, or to the human mind, we conceive a thinking being in general.

Ideas formed in this manner, which are what we properly call *abſtract ideas*, become general repreſentatives of all objects of the ſane kind; and their names applicable to whatever exiſts conformable to ſuch ideas. Thus the idea of colour that we receive from chalk, ſnow, milk, &c. is a repreſentative of all of that kind; and has a name given it, *whiteneſs*, which ſignifies the ſame quality wherever found or imagined.

ABSTRUSE, ſomething deep, hidden, concealed, or far removed from common apprehenſions, and therefore not eaſily underſtood; in oppoſition to what is obvious and palpable. Thus metaphyſics is an abſtruſe ſcience; and the doctrine of fluxions, and the method *de maximis et minimis*, are abſtruſe points of knowledge.

ABSURD, an epithet applied to any thing that oppoſes the human apprehenſion and contradicts a manifeſt truth. Thus, it would be abſurd to ſay that 6 and 6 make only 10, or to deny that twice 6 make 12. When the term *abſurd* is applied to actions, it has the ſame import as *ridiculous*.

ABSYNTHIUM. See ABSINTHIUM.

ABSYRTUS, in the heathen mythology, the ſon of Æta and Hypſea, and the brother of Medea. The latter running away with Jaſon, after her having aſſiſted him in carrying off the golden fleece, was purſued by her father; when, to ſtop his progreſs, ſhe tore Abſyrtus in pieces, and ſcattered his limbs in his way.

ABTHANES, a title of honour uſed by the ancient inhabitants of Scotland, who called their nobles *thanes*, which in the old Saxon ſignifies *king's miniſter's;* and of theſe the higher rank were ſtyled *abthanes*, and thoſe of the lower *underthanes*.

ABUCCO, ABOCCO, or ABOCCHI, a weight uſed in the kingdom of Pegu. One abucco contains 12½ teccalis; two abuccos make a *giro* or *agire*; two *giri*, half a *hiza;* and a *hiza* weighs an hundred teccalis; that is, two pounds five ounces the heavy weight, or three pounds nine ounces the light weight of Venice.

ABUKESO, in commerce, the ſame with ASLAN.

ABULFARAGIUS (Gregory), ſon to Aaron a phyſician, born in 1226, in the city of Malatia, near the ſource of the Euphrates in Armenia. He followed the profeſſion of his father; and practiſed with great ſucceſs, numbers of people coming from the moſt remote parts to aſk his advice. However, he would hardly have been known at this time, had his knowledge been confined to phyſic: but he applied himſelf to the ſtudy of the Greek, Syriac, and Arabic languages, as well as philoſophy and divinity; and he wrote a hiſtory which does honour to his memory. It is written in Arabic, and divided into dynaſties. It conſiſts of ten parts, being an epitome of univerſal hiſtory from the creation of the world to his own time. Dr Pocock publiſhed it with a Latin tranſlation in 1663; and added, by way of ſupplement, a ſhort continuation relating to the hiſtory of the eaſtern princes.

ABUNA, the title given to the archbiſhop or metropolitan of Abyſſinia. See ABYSSINIA.

ABUNDANT NUMBER, in arithmetic, is a number, the ſum of whoſe aliquot parts is greater than the number itſelf. Thus the aliquot parts of 12, being 1, 2, 3, 4, and 6, they make, when added together, 16. An abundant number is oppoſed to a *deficient* number, or that which is greater than all its aliquot parts taken together; as 14, whoſe aliquot parts are 1, 2, and 7, which make no more than ten: and to a *perfect* number, or one to which its aliquot parts are equal, as 6, whoſe aliquot parts are 1, 2, and 3.

ABUNDANTIA, a heathen divinity, repreſented in ancient monuments under the figure of a woman with a pleaſing aſpect, crowned with garlands of flowers, pouring all ſorts of fruit out of a horn which ſhe holds in her right hand, and ſcattering grain with her left, taken promiſcuouſly from a ſheaf of corn. On a medal of Trajan, ſhe is repreſented with two cornucopiæ.

ABUSAID, (Ebn Aljaptu), ſultan of the Moguls, ſucceeded his father anno 717 of the hegira. He was the laſt monarch of the race of Jenghizkhan; and after his death, which happened the ſame year that Tamerlane was born, the empire was made a ſcene of blood and deſolation.

ABUS, (anc. geog.), a river of Britain, formed by the confluence of the Ure, the Derwent, Trent, &c. falling into the German ſea, between Yorkſhire and Lincolnſhire, and forming the mouth of the Humber.

ABUSE, an irregular uſe of a thing, or the introducing ſomething contrary to the true intention thereof. In grammar, to apply a word *abuſively*, or in an *abuſive* ſenſe, is to miſapply or pervert its meaning.—A permutation of benefices, without the conſent of the biſhop, is termed *abuſive*, and conſequently null.

ABUTILON, in botany, the trivial name of ſeveral ſpecies of the ſida. See SIDA.

ABYDOS, (anc. geog.), anciently a town built by the Mileſians in Aſia, on the Helleſpont, where it is ſcarce a mile over, oppoſite to Seſtos on the European ſide. Now both called the *Dardanelles*. Abydos lay midway between Lampſacus and Ilium, famous for Xerxes's bridge, (Herodotus, Virgil); and for the loves of Leander and Hero. (Muſæus, Ovid); celebrated alſo for its oyſters, (Ennius, Virgil). The inhabitants were a ſoft, effeminate people, given much to detraction; hence the proverb, *Ne temere Abydum* when we would caution againſt danger, (Stephanus).

ABYDOS, (anc. geog.), anciently an inland town of Egypt, between Ptolemais and Dioſpolis Parva, towards Syene; famous for the palace of Memnon and the temple of Oſiris. A colony of Mileſians; (Stephanus.) It was the only one in the country into which the ſingers and dancers were forbid to enter.

This city, reduced to a village under the empire of Auguſtus, now preſents to our view only an heap of ruins without inhabitants; but to the weſt of theſe ruins is ſtill found the celebrated tomb of Iſmandes. The entrance is under a portico 60 feet high, and ſupported by two rows of maſſy columns. The immoveable ſolidity of the edifice, the huge maſſes which compoſe it, the hieroglyphics it is loaded with, ſtamp it a work of the ancient Egyptians. Beyond it is a temple 300 feet long and 145 wide. Upon entering the monument we meet with an immenſe hall, the roof of which is ſupported by 28 columns 60 feet high and 19 in circumference at the baſe. They are 12 feet diſtant from each other. The enormous ſtones that form the ceiling, perfectly joined and incruſted, as it were, one in the other, offer to the eye nothing but one ſolid platform of marble 116 feet long and 26 wide. The walls are covered with hieroglyphics. One ſees there a multitude of animals, birds, and human figures with pointed caps on their heads, and a piece of ſtuff hanging down behind, dreſſed in looſe robes that came down only to the waiſt. The ſculpture, however, is clumſy; the forms of the body, the attitudes and proportions of the members, ill obſerved. Amongſt theſe we may diſtinguiſh ſome women ſuckling their children, and men preſenting offerings to them. Here alſo we meet with the divinities of India. Monſieur Chevalier, formerly governor of Chandernagore, who reſided 20 years in that country, carefully viſited this monument on his return from Bengal. He remarked here the gods *Jaggrenat*, *Gonez*, and *Vechnou* or *Wiſtnou*, ſuch as they are repreſented in the temples of Indoſtan.—A great gate opens at the bottom of the firſt hall, which leads to an apartment 46 feet long by 22 wide. Six ſquare pillars ſupport the roof of it; and at the angles are the doors of four other chambers, but ſo choaked up with rubbiſh that they cannot now be entered. The laſt hall, 64 feet long by 24 wide, has ſtairs by which one deſcends into the ſubterraneous apartments of this grand edifice. The Arabas, in ſearching after treaſure, have piled

piled up heaps of earth and rubbiſh. In the part we are able to penetrate, ſculpture and hieroglyphics are diſcoverable as in the upper ſtory. The natives ſay that they correſpond exactly with thoſe above ground, and that the columns are as deep in the earth as they are lofty above ground. It would be dangerous to go far into thoſe vault; for the air of them is ſo loaded with a mephitic vapour, that a candle can ſcarce be kept burning in them. Six lions heads, placed on the two ſides of the temple, ſerve as ſpouts to carry off the water. You mount to the top by a ſtaircaſe of a very ſingular ſtructure. It is built with ſtones incruſted in the wall, and projecting ſix feet out; ſo that being ſupported only at one end, they appear to be ſuſpended in the air. The walls, the roof, and the columns of this edifice, have ſuffered nothing from the injuries of time; and did not the hieroglyphics, by being corroded in ſome places, mark its antiquity, it would appear to have been newly built. The ſolidity is ſuch, that unleſs people make a point of deſtroying it, the building muſt laſt a great number of ages. Except the coloſſal figures, whoſe heads ſerve as an ornament to the capitals of the columns, and which are ſculptured *in relievo*, the reſt of the hieroglyphics which cover the inſide are carved in ſtone. To the left of this great building we meet with another much ſmaller, at the bottom of which is a ſort of altar. This was probably the ſanctuary of the temple of Oſiris.

ABYLA, (Ptolemy, Mela); one of Hercules's pillars on the African ſide, called by the Spaniards *Sierra de las Monas*, over againſt Calpe in Spain, the other pillar; ſuppoſed to have been formerly joined, but ſeparated by Hercules, and thus to have given entrance to the ſea now called the *Mediterranean*: the limits of the labours of Hercules, (Pliny.)

ABYSS, in a general ſenſe, denotes ſomething profound, and, as it were, bottomleſs. The word is originally Greek, ἀβυσσος; compounded of the primitive *a*, and βυσσος, *q. d.* without a bottom.

Abyss, in a more particular ſenſe, denots a deep maſs or fund of waters. In this ſenſe, the word is particularly uſed, in the Septuagint, for the water which God created at the beginning with the earth, which encompaſſed it round, and which our tranſlators render by *deep*. Thus it is that darkneſs is ſaid to be upon the face of the abyſs.

Abyss is alſo uſed for an immenſe cavern in the earth, wherein God is ſuppoſed to have collected all thoſe waters on the third day; which, in our verſion, is rendered the *ſeas*, and elſewhere the *great deep*. Dr Woodward, in his Natural Hiſtory of the Earth, aſſerts, That there is a mighty collection of waters incloſed in the bowels of the earth, conſtituting a huge orb in the interior or central parts of it; and over the ſurface of this water he ſuppoſes the terreſtrial ſtrata to be expanded. This, according to him, is what Moſes calls *the great deep*, and what moſt authors render *the great abyſs*. The water of this vaſt abyſs, he alleges, does communicate with that of the ocean, by means of certain hiatuſes or chaſms paſſing betwixt it and the bottom of the ocean: and this and the abyſs he ſuppoſes to have one common centre, around which the water of both is placed; but ſo, that the ordinary ſurface of the abyſs is not level with that of the ocean, nor at ſo great a diſtance from the centre as the other, it being for the moſt part reſtrained and depreſſed by the ſtrata of earth lying upon it; but whenever thoſe ſtrata are broken, or ſo lax and porous that water can pervade them, there the water of the abyſs aſcends: fills up all the clefts and fiſſures into which it can get admittance; and ſaturates all the interſtices and pores of the earth, ſtone, or other matter all around the globe, quite up to the level of the ocean.

The exiſtence of an abyſs or receptacle of ſubterraneous waters, is controverted by Camerarius*; and defended by Dr Woodward chiefly by two arguments: the firſt drawn from the vaſt quantity of water which covered the earth in the time of the deluge; the ſecond, from the conſideration of earthquakes, which he endeavours to ſhow are occaſioned by the violence of the waters in this abyſs. A great part of the terreſtrial globe has been frequently ſhaken at the ſame moment; which argues, according to him, that the waters, which were the occaſion thereof, were co-extended with that part of the globe. There are even inſtances of univerſal earthquakes; which (ſays he) ſhow, that the whole abyſs muſt have been agitated: for ſo general an effect muſt have been produced by as a general cauſe, and that cauſe can be nothing but the ſubterraneous abyſs†.

*Diſſert. Taur. Acta Erud. ſupp. tom. vi. p. 24.

To this abyſs alſo has been attributed the origin of ſprings and rivers; the level maintained in the ſurface of different ſeas; and their not overflowing their banks. To the effluvias emitted from it, ſome even attribute all the diverſities of weather and change in our atmoſphere‡. Ray¶, and other authors, ancient as well as modern, ſuppoſe a communication between the Caſpian ſea and the ocean by means of a ſubterranean abyſs: and to this they attribute it that the Caſpian ſea does not overflow, notwithſtanding the great number of large rivers it receives, of which Kempfer reckons above 50 in the compaſs of 60 miles; tho', as to this, others ſuppoſe that the daily evaporation may ſuffice to keep the level.

† Hiſt. of the Earth. Journal de Scavans, tom. lviii. p. 393. Memoirs of Literature, tom. viii. p. 101, &c.

‡ Holloway Introd. to Woodward's hiſt. of the Erth Acta Eud 1727, p 313.

¶ Phyſico Theol. Diſc. ii. c. 2. p. 76.

The different arguments concerning this ſubject may be ſeen collected and amplified in *Cockburn's Inquiry into the Truth and Certainty of the Moſaic Deluge*, p. 271, &c. After all, however, this amazing theory of a central abyſs is far from being demonſtrated: it will perhaps in ſeveral reſpects appear inconſiſtent with ſound philoſophy, as well as repugnant to the phenomena of nature. In particular, if we believe any thing like electric attraction to have prevailed in the formation of the earth, we muſt believe that the ſeparation of the chaos proceeded from the union of ſimilar particles. It is certain that reſt is favourable to ſuch operations of nature. As, therefore, the central parts of the earth were more immediately quieſcent than thoſe remote from the centre, it ſeems abſurd to ſuppoſe that the heavier and denſer bodies gave place to the more light and fluid; that the central part ſhould conſiſt of water only, and the more ſuperficial part of a cruſt or ſhell. Vid. *Whitehurſt's Inquiry into the original Formation of the Strata*, &c. See Deluge.

Abyss is alſo uſed to denote hell; in which ſenſe the word is ſynonymous with what is otherwiſe called *Barathrum*, *Erebus*, and *Tartarus*; in the Engliſh bible, the *bottomleſs pit*. The unclean ſpirits expelled by Chriſt, Abyss. Abyssinia.

Christ, begged, *ne imperaret un in abyssum irent*, according to the vulgate; εις αβυσσον according to the Greek. Luke viii. 31. Rev. ix. 1.

Abyss is more particularly used, in antiquity, to denote the temple of Proserpine. It was thus called on account of the immense fund of gold and riches deposited there; some say, hid under ground.

Abyss is also used in heraldry to denote the centre of an escutcheon. In which sense a thing is said to be bore in abyss, *en abysme*, when placed in the middle of the shield, clear from any other bearing: He bears azure, a flower de lis, in abyss.

ABYSSINIA, by some called *Higher Ethiopia*, and by the Arabians *Al Habash*, is bounded on the north by Nubia; on the east, by the Arabic gulph or Red Sea, and the kingdom of Adel; on the south, by the kingdoms of Ajan, Alabo, and Gingiro; and on the west, by the kingdoms of Goram, and part of Gingiro; and is divided into a great number of provinces. The principal river is the Nile, which has its source in this country; and the most considerable lake, that of Dambea, which discharges itself into the Nile, is about 700 miles in length, and 90 in breadth. The air is pretty temperate in the mountains, and therefore their towns and strong holds are generally placed on them; but in the valleys it is hot and suffocating. The soil and face of the country is various. In some places there are nothing but rocks and profound caverns: in others, especially where there are rivers, the land is exceedingly fruitful; and the banks of these streams are bordered with flowers of various kinds, many of which are unknown in Europe. The torrents in the rainy season wash a great deal of gold from the mountains. This season begins in May, when the sun is vertical, or directly over their heads, and ends in September.—The country produces a great variety of animals, both tame and wild, such as lions, tigers, rhinocerose, leopards, elephants, monkeys, stags, deer; horses, camels, dromedaries, goats, cows, sheep; likewise ostriches, with a vast variety of other birds. In the rivers are crocodiles and the hippopotamus. Travellers mention also a peculiar kind of bees, small, black, and without a sting, which hive in the earth, and make honey and wax that are extremely white. The country is greatly infested with locusts, which devour every thing that is green wherever they come.

The inhabitants are Moors, Pagans, Jews, and Christians. The last was the reigning and established religion when father Lobo visited this country in 1624. This diversity of people and religion is the reason that the kingdom, in different parts, is under different forms of government, and that their laws and customs are extremely various. Some of the people neither sow their lands nor improve them; but live on milk and flesh, and encamp like the Arabs, without any settled habitation. In some places they practise no rites of worship, though they believe that there dwells in the regions above a Being who governs the world: This deity they call *Oul*. In these parts where Christianity is professed, it is so corrupted with superstitious errors, and so mingled with ceremonies borrowed from the Jews, that little beside the name of Christianity is to be found among them. (See the next article.)—They have two harvests in the year; one in winter, which begins in May, and lasts, with great rigour, through the months of July, August, and September; and the other in spring. Every man who has a thousand cows saves once a-year a day's milk, and makes a bath for his friends; so that to give an idea of a man's wealth, their common expression is, *he bathes so many times a-year*. Their males marry about ten years old, and their females younger. Their marriage tie is so loose, that they part whenever they find that they cannot live agreeably together.

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Besides the large towns, there are a great number of villages, which in some places are so thick sown, that they look like one continued town: the houses are very mean, being but one story high, and built of straw, earth, and lime. In most of the towns the houses are separated by hedges, which are always green, and mixed with flowers and fruit-trees at a certain distance from each other, which affords an agreeable prospect. The government is monarchical. The sovereign has the title of Negus, and is an absolute prince. When he is in camp, the tents are so regularly disposed as to have the appearance of a city; and there is a captain over every division, to prevent disorders, and to execute justice.

The Abyssines in general are of an olive complexion, tall, graceful, and well featured. Those who are neither mechanics nor tradesmen (which few of them are) nor tillers of the ground, are inured to bear arms, which are a head-piece, a buckler, a coat of mail, bows and arrows, darts, pikes capped with iron at both ends, a sling, and a sword: they have very few fire-arms, and those were introduced by the Portuguese. The habit of persons of quality is a fine silken vest, or fine cotton, with a kind of scarf. The citizens have the same habit, only coarser. The common people have nothing but a pair of cotton drawers, and a scarf which covers the rest of their body. The women are of a healthy constitution, active, and moderately handsome, having neither flat noses nor thick lips like the negroes; and nature is so friendly, that they stand in little need of midwives, which is indeed the case, of most countries in the torrid zone. They appear in public as in Europe, without being forbid the conversation of the men as among the Mahometans. Princesses of the royal blood are not permitted to marry foreigners: and when they take the air, they go in great state, with 400 or 500 women attendants. Their language is the Ethiopic, which bears a great affinity with the Arabic; but particular provinces have a different dialect.

Manufactures are almost wholly wanting in this country; and the few trades which they have amongst them are always conveyed from the father to the children. They seem indeed by their churches, and other ruinated places, to have had a knowledge of architecture. But the workmen were sent for from other countries, and were forced to do all themselves; so that when these fabrics were reared, especially the imperial palace built by Peter Pais, a Portuguese architect, the people flocked from all parts of Ethiopia to view it, and admired it as a new wonder of the world.—Gold, silver, copper, and iron, are the principal ores with which their mines abound in this extensive part of Africa: but not above one third part is made use of by way of merchandize, or converted into money, of which they have little or no use in Abyssinia. They cut their gold indeed into small pieces for the pay of their troops, and for expenses of the court, which is but a modern custom among them;

Abyssinia. them; the king's gold, before the end of the 17th century, being laid up in his treasury in ingots, with intent to be never carried out, or never used in any thing but vessels and trinkets for the service of the palace. In the lieu of small money, they make use of rock salt as white as snow and as hard as stone. This is taken out of the mountain of Lasta, and put into the king's warehouses; where it is reduced into tablets of a foot long, and three inches broad, ten of which are worth about a French crown. When they are circulated in trade, they are reduced into still smaller pieces, as occasion requires. This salt is also applied to the same purpose as common sea-salt. With this mineral salt they purchase pepper, spices, and silk stuffs, which are brought to them by the Indians, in their ports in the Red Sea. Cardamums, ginger, aloes, myrrh, cassia, civet, ebony-wood, ivory, wax, honey, cotton and linens of various sorts and colours, are merchandizes which may be had from Abyssinia; to which may be added sugar, hemp, flax, and excellent wines, if these people had the art of preparing them. It is affirmed there are in this country the finest emeralds that are any where to be found; and, though they are found but in one place, they are there in great quantities, and some so large and so perfect as to be of almost inestimable value. The greatest part of the merchandises abovementioned, are more for foreign than inland trade. Their domestic commerce consists chiefly in salt, honey, buck-wheat, grey pease, citrons, oranges, lemons, and other provisions, with fruits and herbage necessary for the support of life. Those places that the Abyssian merchants frequent the most, who dare venture to carry their commodities by sea themselves, are Arabia Felix, and the Indies, particularly Goa, Cambaye, Bengal, and Sumatra. With regard to their ports on the Red Sea, to which foreign merchants commonly resort, the most considerable are those of Mette, Azum, Zajalla, Maja, Dazo, Patea, and Brava. The trade of the Abyssinians by land is inconsiderable. There are, however, bands of them who arrive yearly at Egypt, particularly at Cairo, laden with gold dust, which they bring to barter for the merchandises of that country, or of Europe, for which they have occasion. These cafilas or caravans, if we may be allowed thus to call a body of 40 or 50 poor wretches who unite together for their mutual assistance in their journey, are commonly three or four months on their route, traversing forests and mountains almost impassable, in order to exchange their gold for necessaries for their families, and return immediately with the greatest part of the merchandise on their backs. Frequently the Jews or Egyptians give them large credit; which may seem surprising, as they are beyond recourse if they should fail of payment. But experience has shown, that they have never abused the confidence reposed in them; and even in the event of death, their fellow-travellers take care of the effects of the deceased for the benefit of their families, but in the first place for the discharge of those debts contracted at Cairo.—It remains only to be observed, that one of the principal branches of trade of the Abyssines is that of slaves; who are greatly esteemed in the Indies and Arabia for the best and most faithful, of all that the other kingdoms of Africa furnish. The Indian and Arabian merchants frequently substitute them as their factors; and, on account of their good services and integrity, not only often give them their liberty, but liberally reward them.

Into this part of the globe the admission of travellers has been supposed extremely difficult, and their return from thence almost impracticable. A Scotch gentleman, however, of family and fortune, James Bruce, Esq; of Kinnaird, is known not only to have entered that country, but to have resided in it several years, and returned safe home, bringing with him many great curiosities. Soon after his return, the following notice was given by the Count de Buffon in an advertisement prefixed to the 3d volume of his History of Birds: "A new aid which I have received, and which I am anxious to announce to the public, is the free and generous communication which I had of the drawings and observations of James Bruce, Esq; of Kinnaird, who returning from Numidia, and the interior parts of Abyssinia, stopt in my house for several days, and made me a partaker of the knowledge which he had acquired in a tour no less fatiguing than hazardous. It filled me with the utmost astonishment to view the numerous drawings which he had made and coloured himself. He possesses the most perfect representations and descriptions of the birds, fishes, plants, edifices, monuments, dress, arms, &c. of different nations, all of them objects worthy of knowledge. Nothing has escaped his curiosity, and his talents have been proportioned to it. The English government will without doubt take proper measures for the publication of his work. That respectable nation, which has given a lead to all others in discoveries of every kind, will not fail to add to its glory, by speedily communicating to the world at large, those of this excellent traveller, who, not contented with accurate descriptions of nature, has made many important observations on the culture of different kinds of grains; on the navigation of the Red Sea; on the course of the Nile, from its mouth to its source, which he has been the first to discover; and on different particulars which may be of the highest utility to commerce and agriculture, those great arts which are but little known and ill cultivated. Yet, on these alone, the superiority of one nation over another does depend, and for ever will depend."

It is much to be regretted, that after so long an interval, this gentleman's discoveries have not yet made their appearance. The delay has given rise to various speculations. Doubts have even been entertained concerning the credibility of the reports that have transpired, or been gathered from his conversation. His honour and abilities, however, are too extensively known to be affected by such injurious insinuations. That he hath great talents for the information of his readers, appears by his dissertation on the Theban harp*, which Dr Burney hath inserted in the first volume of his History of Music, and in which are also mentioned several of the Abyssinian instruments. Mr Bruce moreover, is said to have a great facility in learning languages, and talents for drawing; nor perhaps was any other traveller furnished with so large and scientific an apparatus of instruments. Add to all this, that he is possessed of a spirit and enterprise not easily to be equalled. The speedy production, therefore, of so interesting an account as he is capable of giving of this almost unfrequented part of Africa, cannot but still be earnestly

* See the article **Harp** in this Dictionary.

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earnestly wished for. In the mean time, the following authentic anecdotes will not, it is presumed, be unacceptable, nor appear foreign to the present article.

Mr Bruce was appointed consul to Algiers, where he continued till 1765. In June 1764, he requested leave of absence from the secretary of state for the southern department, in order to make some drawings of antiquities near Tunis.

In Mr Bruce's last letter from Algiers to the same secretary (dated December 29. 1764), he alludes to another leave of absence, which he had likewise requested, that he might visit parts of the African continent. He explains himself no farther in this letter; but it is believed that he proceeded considerably to the southward of Algiers, and made those very capital drawings of remains of Roman architecture, which many have seen since his return to Britain. Before he set out for Algiers, he informed some of his friends, that the making such excursions for these interesting purposes was his principal inducement for accepting the consulship.

How long he continued in Africa, the present writer has not had the opportunity of procuring information; but having intentions afterwards of visiting Palmyra, he was shipwrecked on the coast of Tunis, and plundered of every thing by the barbarous inhabitants.

The most distressing part of the loss was probably that of his instruments, so necessary to a scientific traveller; and though he afterwards procured some of these, yet others (particularly a quadrant) could not be recovered. Mr Bruce, however, determining to repair this loss as soon as possible from France, so much nearer to him than England, was so fortunate as to be provided with a time-piece and quadrant from that quarter. Upon this occasion Lewis XV. presented him with an iron quadrant of four feet radius, as he had probably represented to the academy of sciences his want of such an instrument whilst he should be in Abyssinia: Mr Bruce brought back with him to England this cumbrous fellow-traveller, and, having put upon it an inscription to the following purport, is said to have presented it to the university of Glasgow: "With this instrument given by the king of France, Lewis XV. Mr Bruce proceeded to the sources of the Nile, it being carried on foot, upon mens shoulders, over the mountains of Abyssinia." This information was received from that eminent maker of instruments Mr Nairne.

Where and when Mr Bruce received the French instruments is not known; but as he was still bent on visiting Abyssinia, he gave a commission to Mr W. Russel, F. R. S. for a reflecting telescope, made by *Bird* or *Short*; a watch with a hand to point seconds, and the newest and completest English astronomical tables; all of which were to be sent to Mr Fremaux, and forwarded to him at Alexandria before August. On the 29th of March 1768, Mr Bruce was at Sidon on the coast of Syria, and wrote to Mr Russel from thence for the following additional instruments, viz. a twelve-feet reflecting telescope, to be divided into pieces of three feet, and joined with screws. This telescope was also accompanied by two thermometers and two portable barometers. Mr Bruce moreover informed Mr Russel, that he was going into a country (viz. Abyssinia) from which few travellers had returned; and wished Mr Russel, or his philosophical friends, would send him their desiderata, as he was entirely at their service. Mr Bruce added, that if he could not obtain admission into Abyssinia, he still would do his best in the cause of science on the eastern coast of the Red Sea.

As Mr Bruce had directed the instruments to be ready for him at Alexandria by the beginning of August 1768, it is probable that he reached Cairo about that time; from whence he proceeded to Abyssinia, by way of JEDDA, MAZAVA, and ARQUICO.

It is supposed that Mr Bruce did not continue long at Jedda, as he is said to have explored the coast on the east side as low as Mocha, during which drawings were taken of many curious fish in the Red Sea. Mr Bruce must also have entered Abyssinia, either at the latter end of 1768, or the very beginning of 1769, as he made an observation in that part of Africa on the 15th of January of that year.

In this perilous enterprise he was accompanied by a Greek servant (named *Michael*), and an Italian painter, who probably assisted in the numerous articles which might deserve representation, and who died of a flux before Mr Bruce's return to Cairo in 1773. Mr Bruce must at times also have been assisted by many others, as his instruments, apparatus for drawings, and other necessaries, from their weight and bulk could not be easily transported from place to place, and perhaps required beasts of burden. To these likewise must be added several medicines which enabled him to perform cures on the inhabitants, and probably occasioned the good reception he afterwards met with.

Such other particulars as happened to Mr Bruce, during his long residence in this unfrequented country, must be left to his own superior narrative; and it shall suffice, therefore, only to state, that he made a large number of observations to fix the situations of places, out of which 31 have been examined and computed by the astronomer royal. The first of these observations was made on the 10th of January 1769, and the last on the 5th of October 1772, from 30 to 38 degrees of east longitude from Greenwich, and from 12 to 28 degrees of north latitude. It need scarcely be said therefore, that these observations, which include so large an extent of almost unknown country, must prove a most valuable addition to geography; and the more so, because the Portuguese, who first visited Abyssinia, give neither longitude nor latitude of any place in that empire; and Poncet only two latitudes, viz. those of Sennar and Giesum.

As Mr Bruce made the last of his observations on the 5th of October 1772, it is probable that he might then be on his return to Cairo, through Nubia and Upper Egypt, where he arrived on the 15th of January 1773, after an absence of more than four years; bringing back with him his Greek servant, named Michael.

Mr Bruce continued at Cairo four months, during which time he had daily intercourse with Mr Antes; the substance of a letter from whom will contain the principal confutation of Baron Tott, and others, who have been incredulous with regard to Mr Bruce's expected narrative.

Mr Antes was born of German parents, who were possessed of lands in the back settlements of Pennsylva-

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nia; and having showed early abilities as a mechanic, removed to Europe, where he distinguished himself in the art of watch-making, which he learned without apprenticeship. Being a member of the church known by the name of *Unitas Fratrum*, and commonly called *Moravian*, he wished to be employed in their missions, and more especially that of the same persuasion established at Cairo, who always have desired to procure opportunities of instructing the Abyssinians.

Mr Bruce had left Cairo fifteen months before Mr Antes came there; and the intercourse, therefore, between them first took place on Mr Bruce's return in 1773.

Having given this account of Mr Bruce and Mr Antes's being first known to each other, we shall state the substance of some information received from the latter, who is now established at Fulneck near Leeds, after having resided eleven years at Cairo.

" That Mr Bruce left Cairo in 1768, and proceeded thence by way of Jedda, Mazava, and Arquico, into Abyssinia.

" That in 1771, a Greek came from Gondar (the capital) in Abyssinia, who had a draught from Mr Bruce on a French Merchant at Cairo (named *Rosé*) for some hundreds of German crowns, which were paid immediately. This draught was accompanied by a letter from Mr Bruce, and was the first time that he had been heard of at Cairo since his departure in 1768.

" That after Mr Bruce's return to Cairo in 1773, Mr Antes saw a young Armenian and his father (who came likewise from Gondar) at Mr Pini's, an Italian merchant of Cairo, where they and Mr Bruce conversed in the Abyssinian language, and seemed glad to meet him again.

" That Mr Bruce returned to Cairo from Abyssinia by way of Nubia and Upper Egypt; which can be fully attested by the Franciscan friars who are established at Isne near Asyuwan, which latter is the highest town of Upper Egypt.

" That during Mr Bruce's stay at Cairo, which was not less than four months, no day passed without their seeing each other; which gave Mr Antes frequent opportunities of inquiring with regard to Abyssinia, concerning which he was particularly interested from a reason before stated.

" Than Mr Antes likewise frequently conversed with Michael, Mr Bruce's Greek servant; who is stated to have by no means had a lively imagination, and who always agreed with the circumstances mentioned by his master, and more particularly in relation to their having visited the sources of the Nile; which the Baron Tott doubts of, from having had a conversation with this same Greek servant.

Mr Antes adds, " That Baron Tott staid but a few days at Cairo; and, from his short residence in that country, hath given several erroneous accounts relative to Egypt. Mr Antes, on the other hand, had almost daily conversations with Michael for several years, and often in relation to the sources of the Nile."

Lastly, " That after Mr Bruce left Cairo, Mr Antes had conversed with others who had known Mr Bruce in Abyssinia, and that he was there called *Maalim Jakube*, or Mr James.

After this state of facts, it is conceived that no one can entertain a reasonable doubt with regard to Mr Bruce's not only having visited, but resided long in Abyssinia; though it is remarkable that the Jesuits expressed the same doubts in relation to Poncet, who had continued there nearly as long as Mr Bruce. Poncet happened to be a layman; and the Jesuits, perhaps, would not approve of any narrative that did not come from father Benevent, who accompanied Poncet to Abyssinia, but unfortunately died there (*a*).

Driven, however, from this hold, the objectors will possibly retain their incredulity as to many particulars to be related.

The first of these is, the having visited the sources of the Nile; " which, from classical education, we cannot easily believe, as they were unknown to the ancients, though they had so great curiosity with regard to this discovery."

Many things, however, have been accomplished by travellers in modern times, which the ancients never could atchieve, and which may be attributed to their want of enterprise (as travellers at least), of languages, and lastly the not being able to procure credit when in a distant country. Mr Bruce could not have continued so long as he did in Abyssinia, unless he had drawn from Gondar upon a merchant established at Cairo.

The difficulty, however, with regard to reaching the sources of the Nile, arises principally from the uncivilized state of Abyssinia, unless the traveller hath a proper introduction (*b*). When once this is procured, all difficulties seem to cease, as we find by Lobo's (*c*) account of this same discovery, and likewise by Poncet's

(*a*) It must be admitted, however, that we owe to the zeal of the Jesuits the best accounts we have both of China and Paraguay. Few laymen have been actuated so strongly for the promotion of geography and science as Mr Bruce; and we must therefore (upon the order of the Jesuits being abolished) look up chiefly to the missionaries from the church of the Unitas Fratrum, who, though differing so totally in other respects, seem to have an equal ardour with the Jesuits for instructing the inhabitants of countries unfrequented by Europeans. Such missions are already established in West Greenland, the coast of Labrador, N. Lat. 56. the back settlements of Carolina and Pensylvania, in India, Bengal, and the Nicobar islands. Those established on the coast of Labrador send over yearly meteorological journals, which are communicated to the Royal Society. As for the dispute between Poncet and Maillet the French consul at Cairo, See Mod. Univ. Hist. vol. 6.

(*b*) The professing the knowledge of medicine was Poncet's introduction, and seems to have been that of Mr Bruce. Even in our own civilized country, how are quacks and mountebanks resorted to? And what an impression must Mr Bruce, with his magnificent and scientific apparatus, have made upon the inhabitants of such a country as Abyssinia?

(*c*) In father Telles's compilation. See also Ludolff, who describes the sources from Gregory, who was a native of Abyssinia. Father Paez was the first who visited them, A. D. 1622. His account of this is said to be in the archives cet's narrative, who was prevented by illness from visiting the very spot, but hath given an ample relation from an Abyssinian who had often been there. Poncet, moreover, had obtained leave from the emperor to make this journey, which he states as not being a distant one, and that the emperor hath a palace near the very sources.

If it be doubted whether Mr Bruce hath visited every source of the Nile, it may be answered, that perhaps no Englishman hath taken this trouble with regard to the sources of the Thames, which, like most other great rivers, is probably derived from many springs and rills in different directions.

The other objection which we have often heard, is, "That Mr Bruce hath mentioned in conversation, that the Abyssinians cut a slice from the living ox, esteeming it one of their greatest delicacies."

This sort of dainty, indeed, is not so considered in other parts of the globe; but every nation almost hath its peculiarities in the choice of their food. Do not we eat raw oysters within a second of their being separated from the shell? And do not we roast both them and lobsters whilst alive; the barbarity of which practice seems to equal that of the Abyssinians? Do not cooks skin eels whilst alive? And do not epicures crimp fish for the gratification of their appetites.

That the Abyssinians eat beef in a raw state, is agreed both by Lobo and Poncet; and the former says, *reeking* from the beast. Mr Antes, moreover, was told by a Franciscan monk, who went with the caravan from Abyssinia to Cairo (*d*), that he was witness of an ox being killed, and immediately devoured by the band of travellers.

One reason, perhaps, for this usage may be, the great heat of the climate, which will not permit meat to be kept a sufficient time to make it tender (as with us): and it is generally allowed, that a fowl, dressed immediately after it is killed, is in better order for eating than if it is kept four and twenty hours.

Is it therefore extraordinary, that an Abyssinian epicure may really find (or perhaps fancy) that a piece cut from the beast whilst alive, may be more tender, or have a better relish, than if it is previously killed by the butcher? To this may be added, that according to the information which has been received on this head, Mr Bruce's account of this practice is much misrepresented by the objectors, who suppose that the ox lives a considerable time after these pieces are cut from it. When these dainty bits, however, have been sent to the great man's table (and which are probably taken from the fleshy parts), the beast soon afterwards expires, when the first artery is cut, in providing slices for the numerous attendants.

Upon the whole, the not giving credit to a traveller, because he mentions an usage which is very different from ours (and is undoubtedly very barbarous), seems rather to argue ignorance than acuteness.

This brings to recollection the incredulity which was shown to another distinguished traveller, Dr Shaw; who having mentioned, in an Oxford common room, that some of the Algerines were fond of lion's flesh, never could obtain any credit afterwards from his brother-fellows of the same college, though many of them were learned men. It is well known, however, tho' Dr Shaw states this same circumstance in the publication of his travels, that he is cited with the greatest approbation in almost every part of Europe. Sir William Temple somewhere mentions, that a Dutch governor of Batavia, who lived much with one of the most considerable inhabitants of Java, could never obtain any credit from him after having mentioned, that in Holland water became a solid body. The traveller who first saw a flying fish probably told every one of this extraordinary circumstance as soon as he set his foot on shore, and was probably discredited with regard to the other particulars of his voyage.

The natural cause and progress of the incredulity, which a traveller generally experiences, seems to be the following:

When he returns from a distant and little frequented country, every one is impatient to hear his narrative; from which, of course, he selects the more striking parts, and particularly the usages which differ most from our own. Some of the audience, disbelieving what the traveller hath mentioned, put questions to him which show their distrust. The traveller by this treatment becomes irritated, and answers some of them peevishly, others ironically, of which the interrogators afterwards take advantage to his prejudice. Nothing is more irritating to an ingenuous person than to find his assertions are disbelieved. This is commonly experienced in the cross examinations of almost every witness. To the distresses of the traveller on his return, we may add, the being often teased by very ignorant questions.

ABYSSINIAN, in ecclesiastical history, is used as the name of a sect, or heresy, in the Christian church, established in the empire of Abyssinia. The Abyssinians are a branch of the Copts or Jacobites; with whom they agree in admitting but one nature in Jesus Christ, and rejecting the council of Chalcedon: whence they are also called Eutychians, and stand opposed to the Melchites. They are only distinguished from the Copts, and other sects of Jacobites, by some peculiar national usages.—The Abyssinian sect or church is governed by a bishop or metropolitan styled *Abuna*, sent them by the Coptic patriarch of Alexandria residing at Cairo, who is the only person that ordains priests. The next dignity is that of Komos, or Hegumenas, who is a kind of arch-presbyter. They have canons also, and monks: the former of whom marry; the latter, at their admission, vow celibacy, but with a reservation: these, it is said, make a promise aloud, before their superior, to keep chastity; but add, in a low voice, *as you keep it*. The emperor has a kind of supremacy in ecclesiastical matters. He alone

archives of the college *de propaganda fide* at Rome. It is believed that there are many other curious particulars for the illustration of geography to be found in the same depository. Dr Shaw mentions, moreover, some papers of Lippi (who accompanied the French embassy into Abyssinia, A. D. 1704), which are to be found in the botanical library at Oxford.

(*d*) This points out another channel by which a traveller of enterprise may visit Abyssinia.

alone takes cognisance of all ecclesiastical causes, except some smaller ones reserved to the judges; and confers all benefices, except that of Abuna.—The Abyssinians have at different times expressed an inclination to be reconciled to the see of Rome; but rather out of interest of state than any other motive. The emperor David, or the queen regent on his behalf, wrote a letter on this head to pope Clement VII. full of submission, and demanding a patriarch from Rome to be instructed by: which being complied with, he publicly adjured the doctrine of Eutychius and Dioscorus in 1626, and allowed the supremacy of the pope. Under the emperor Sultan Seghed all was undone again; the Romish missionaries settled there had their churches taken from them, and their new converts banished or put to death. The congregation *de propaganda* have made several attempts to revive the mission, but to little purpose.—The doctrines and ritual of this sectary from a strange compound of Judaism, Christianity, and superstition. They practise circumcision; and are said toe xtend the practice to the females as well as males: They observe both Saturday and Sunday sabbaths: they eat no meats prohibited by the law of Moses: women are obliged to the legal purifications: and brothers marry their brothers wives, *&c.* On the other hand, they celebrate the epiphany with peculiar festivity, in memory of Christ's baptism; when they plunge and sport in ponds and rivers; which has occasioned some to affirm that they were baptized anew every year. Among the saints-days is one consecrated to Pilate and his wife; by reason Pilate washed his hands before he pronounced sentence on Christ, and his wife desired him to have nothing to do with the blood of that just person. They have four lents: the great one commences ten days earlier than ours, and is observed with much severity, many abstaining therein even from fish, because St Paul says there is one kind of flesh of men, and another of fishes. They allow of divorce, which is easily granted among them, and by the civil judge; nor do their civil laws prohibit polygamy itself. They have at least as many miracles and legends of saints as the Romish church; which proved no small embarrassment to the Jesuit missionaries, to whom they produced so many miracles, wrought by their saints in proof of their religion, and those so well circumstantiated and attested, that the Jesuits were obliged to deny miracles to be any proof of a true religion; and in proof hereof to allege the same arguments against the Abyssinians, which Protestants in Europe allege against Papists. They pray for the dead, and invoke saints and angels; have so great a veneration for the virgin, that they charged the Jesuits with not rendering her honour enough. Images in painting they venerate; but abhor all those in relievo, except the cross. They hold that the soul of man is not created; because, say they, God finished all his work on the sixth day. They admit the apocryphal books, and the canons of the apostles, as well as the apostolical constitutions, for genuine. Their liturgy is given by Alvarez, and in English by Pagit.

ACA, ACE, or ACON, a town of Phoenicia, on the Mediterranean; afterwards called *Ptolemais*; now *Acre*.

ACACALOTL, the Brasilian name of a bird called by some *corvus aquaticus*, or the water-raven: properly, the pelicanus carbo, or corvorant. See PELICANUS.

ACACIA, EGYPTIAN THORN, or BINDING BEAN-TREE, in botany, a species of Mimosa, according to Linnæus; tho' other botanists make it a distinct genus. See MIMOSA.

The flowers of a species of the *acacia* are used by the Chinese in making that yellow, which we see bears washing in their silks and stuffs, and appears with so much elegance in their painting on paper. The method is this:

They gather the flowers before they are fully open; these they put into a clean earthen vessel over a gentle heat, and stir them continually about, as they do the tea-leaves, till they become dryish and of a yellow colour; then to half a pound of the flowers they add three spoonfuls of fair water, and after that a little more, till there is just enough to hold the flowers incorporated together: they boil this for some time, and the juice of the flowers mixing with the water, it becomes thick and yellow; they then take it from the fire, and strain it through a piece of coarse silk. To the liquor they add half an ounce of common alum, and an ounce of calcined oyster-shells reduced to a fine powder. All is then well mixed together; and this is the fine lasting yellow they have so long used.

The dyers of large pieces use the flowers and seeds of the *acacia* for dying three different sorts of yellow. They roast the flowers, as before observed; and then mix the seeds with them, which must be gathered for this purpose when full ripe: by different admixture of these, they give the different shades of colour, only for the deepest of all they give a small mixture of Brazil wood.

Mr Geoffroy attributes the origin of bezoar to the seeds of this plant; which being broused by certain animals, and vellicating the stomach by their great sourness and astringency, cause a condensation of the juices, till at length they become coated over with a stony matter, which we call BEZOAR.

False ACACIA. See ROBINIA.

Three-thorned ACACIA, or *Honey-locust*. See GLEDISTIA.

ACACIA, in the Materia Medica, the inspissated juice of the unripe fruit of the *Mimosa Nilotica*.

This juice is brought from Egypt, in roundish masses, wrapt up in thin bladders. It is outwardly of a deep brown colour, inclining to black; inwardly of a reddish or yellowish brown; of a firm consistence, but not very dry. It soon softens in the mouth, and discovers a rough, not disagreeable taste, which is followed by a sweetish relish. This inspissated juice entirely dissolves in watery liquors; but is scarce sensibly acted on by rectified spirit.

Acacia is a mild astringent medicine. The Egyptians give it in spitting of blood, in the quantity of a dram, dissolved in any convenient liquor; and repeat this dose occasionally: they likewise employ it in collyria for strengthening the eyes, and in gargarisms for quinseys. Among us, it is little otherwise used than as an ingredient in mithridate and theriaca, and is rarely met with in the shops. What is usually sold for the Egyptian acacia, is the inspissated juice of unripe sloes: this is harder, heavier, of a darker colour, and somewhat sharper taste, than the true sort. See the next article.

German ACACIA, the juice of unripe sloes inspissated nearly to dryness over a gentle fire, care being taken to prevent its burning. It is moderately astringent, similar to the Egyptian acacia, for which it has been commonly substituted in the shops. It is given in fluxes, and other disorders where styptic medicines are indicated, from a scruple to a dram.

Acacia, among antiquaries, something resembling a roll or bag, seen on medals, as in the hands of several consuls and emperors. Some take it to represent a handkerchief rolled up, wherewith they made signals at the games; others, a roll of petitions or memorials; and some, a purple bag full of earth, to remind them of their mortality.

ACACIANS, in ecclesiastical history, the name of several sects of heretics; some of which maintained, that the Son was only a similar, not the same, substance with the Father; and others, that he was not only a distinct, but a dissimilar, substance. Two of these sects had their denomination from Acacius bishop of Cæsarea, who lived in the fourth century, and changed his opinions, so as, at different times, to be head of both. Another was named from Acacius patriarch of Constantinople, who lived in the close of the fifth century.

ACACIUS, sirnamed Luscus, because he was blind of one eye, was bishop of Cæsarea in Palestine, and succeeded the famous Eusebius: he had a great share in the banishment of Pope Liberius, and bringing Felix to the see of Rome. He gave name to a sect, and died about the year 365. He wrote the life of Eusebius, and several other works.

Acacius (St.), bishop of Amida, in Mesopotamia, in 420, was distinguished by his piety and charity. He sold the plate belonging to his church, to redeem seven thousand Persian slaves who were ready to die with want and misery; and giving each of them some money, sent them home. Veranius, their king, was so affected with this noble instance of benevolence, that he desired to see the bishop; and this interview procured a peace between that prince and Theodosius I.

There have been several other eminent persons of the same name; particularly, A martyr under the emperor Decius: A patriarch of Antioch, who succeeded Basil in 458, and died in 459: A bishop of Miletum in the fifth century: A famous rhetorician in the reign of the emperor Julian: and, A patriarch of Constantinople in the fifth century; who was ambitious to draw the whole power and authority of Rome by degrees to Constantinople, for which he was delivered over irretrievably to the devil by Pope Felix III.

ACAD, or Achad, (anc. geog.) the town in which Nimrod reigned, called *Archad* by the seventy; situated in Babylonia, to the eastward of the Tigris.

ACADEMICIAN, or Academist, a member of an academy. See Academy in a modern sense.

ACADEMICS, or Academists, a denomination given to the cultivators of a species of philosophy originally derived from Socrates, and afterwards illustrated and enforced by Plato, who taught in a grove near Athens, consecrated to the memory of Academus, an Athenian hero; from which circumstance this philosophy received the name of *academical*. Before the days of Plato, philosophy had in a great measure fallen into contempt. The contradictory systems and hypotheses which had successively been urged upon the world were become so numerous, that, from a view of this inconstancy and uncertainty of human opinions, many were led to conclude, that truth lay beyond the reach of our comprehension. Absolute and universal scepticism was the natural consequence of this conclusion. In order to remedy this abuse of philosophy and of the human faculties, Plato laid hold of the principles of the academical philosophy; and, in his Phædo, reasons in the following manner. "If we are "unable to discover truth, (says he), it must be owing "to two circumstances: either there is no truth in "the nature of things; or the mind, from a defect "in its powers, is not able to apprehend it. Upon "the latter supposition, all the uncertainty and fluc-"tuation in the opinions and judgments of mankind "admit of an easy solution: Let us therefore be mo-"dest, and ascribe our errors to the real weakness "of our own minds, and not to the nature of things "themselves. Truth is often difficult of access; in "order to come at it, we must proceed with caution "and diffidence, carefully examining every step; and "after all our labour, we will frequently find our great-"est efforts disappointed, and be obliged to confess our "ignorance and weakness."

Labour and caution in their researches, in opposition to rash and hasty decisions, were the distinguishing characteristics of the disciples of the ancient academy. A philosopher, possessed of these principles, will be slow in his progress; but will seldom fall into errors, or have occasion to alter his opinion after it is once formed. Vanity and precipitance are the great sources of scepticism. Hurried on by these instead of attending to the cool and deliberate principles recommended by the academy, several modern philosophers have plunged themselves into an absurd and ridiculous kind of scepticism. They pretend to descredit subjects that are plain, simple, and easily comprehended; but give peremptory and decisive judgments upon things that evidently exceed the limits of our capacity. Of these, Berkley and Hume are the most considerable. Berkley denied the existence of every thing, excepting his own ideas. Mr Hume has gone a step further, and questioned even the existence of ideas; but at the same time has not hesitated to give determined opinions with regard to eternity, providence, and a future state, miraculous interpositions of the Deity, &c. subjects far above the reach of our faculties. In his essay on the academical or sceptical philosophy he has confounded two very opposite species of philosophy. After the days of Plato, indeed, the principles of the first academy were grossly corrupted by Arcesilaus, Carneades, &c. This might lead Mr Hume into the notion that the *academical* and *sceptical* philosophy were synonymous terms. But no principles can be of a more opposite nature than those which were inculcated by the old academy of Socrates and Plato, and the sceptical notions which were propagated by Arcesilaus, Carneades, and the other disciples of the succeeding academics.

ACADEMY, in antiquity, a garden, villa, or grove, situated within a mile of Athens, where Plato and his followers held their philosophical conferences. It took its name from one Academus, or Ecademus, who was the original owner of it, and made it a kind of gymnasium: he lived in the time of Theseus; and, after his death, it retained his name, and was consecrated to his

Academies. his memory. Cimon embellished it with fountains, trees, and walks; but Sylla, during the siege of Athens, employed these very trees in making battering engines against the city. Cicero too had his villa, or place of retirement, near Puzzuoli, which he also named an *academy*, where he composed his *Academical questions*, and his book *De natura deorum*.

Academy, among the moderns, is most commonly used to signify a society of learned men established for the improvement of any art or science, and generally under the protection of a prince.

The first Academy we read of, was established by Charlemagne, at the instigation of Alcuin. It was composed of the chief wits of the court, the emperor himself being a member. In their academical conferences, every person was to give an account of what ancient authors he had read; and each even assumed the name of some ancient author who pleased him most, or some celebrated person of antiquity. Alcuin, from whose letters we learn these particulars, took that of Flaccus, the sirname of Horace; a young lord, named Augilbert, took that of Homer: Adelard, bishop of Corbie, was called Augustin: Riculfe, bishop of Mentz, was Dametas; and the king himself, David. This shows the mistake of some modern writers, who relate, that it was in conformity with the genius of the learned men of those times, who were great admirers of Roman names, that Alcuin took the name of Flaccus Albinus.

Most nations have now their academies; but Italy has the greatest number.—The French have many flourishing academies, most of which were established by Lewis XIV.—There are but few in Britain; and those of chiefest note go by a different name. See the article Society.

In giving an account of the principal Academies, it seems most proper to arrange them according to their subjects.

I. *Medical Academies*, as that of the Naturæ Curiosi in Germany; that founded at Palermo in 1645: another at Venice in 1701, which meets weekly in a hall near the grand hospital; another at Geneva in 1715, in the house of M. Le Clerc. The colleges of physicians at London and Edinburgh are also, by some, ranked in the number of *Academies*.

The Academy of *Naturæ Curiosi*, called also the Leopoldine Academy, was founded in 1652, by Jo. Laur. Bauschius, a physician; who, in imitation of the English, published an invitation to all physicians to communicate their extraordinary cases; and, meeting with success, was elected president. Their works were at first published separately; but in 1670 a new scheme was laid for publishing a volume of observations every year. The first volume appeared in 1684, under the title of Ephemerides, and the work has been continued with some interruptions and variations of the title, *&c.* In 1687, the emperor Leopold took the society under his protection, granting the members several privileges, particularly that their presidents should be counts palatine of the holy Roman empire. This academy has no fixed residence, nor regular assemblies; instead of these, there is a kind of bureau, or office, first established at Breslau, and afterwards removed to Nuremberg, where letters, observations, *&c.* from correspondents or members are taken in. The academy consists of a president, two adjuncts or secretaries, and colleagues or members without restriction. The colleagues, at their admission, oblige themselves to two things: first, to choose some object out of the animal, vegetable, or mineral kingdom, to handle, provided it had not been treated of by any colleague before: the second, to apply themselves to furnish materials for the annual Ephemerides. Each member to bear a symbol of the academy; *viz.* a gold ring; whereon, instead of a stone, is a book open, and, on the face thereof, an eye; on the other side the motto of the academy, *Nunquam otiosus*.

II. *Chirurgical Academies*; as that instituted some years ago, by public authority, at Paris: the members of which were not only to publish their own and correspondents observations and improvements; but to give an account of all that is published on surgery, and to compose a complete history of the art, by their extracts from all the authors ancient and modern who have wrote on it. A question in surgery is annually proposed by the academy, and a gold medal of 200 livres value given to him who furnishes the most satisfactory answer.

Academy of Surgery at Vienna, was instituted some years ago by the present emperor, under the direction of the celebrated Brambilla. In this there were at first only two professors; and to their charge the instruction of 130 young men was committed, 30 of whom had formerly been surgeons in the army. But of late the number both of the teachers and pupils has been considerably increased. Gabrielli has been appointed to teach pathology and practice; Boecking, anatomy, physiology, and physics: Streit, medical and pharmaceutical surgery; Hunczowsky, surgical operations, midwifery, and the chirurgia forensis; and Plenk, chemistry and botany. To these also has been added, Beindl, as prosector and extraordinary professor of surgery and anatomy. Besides this, the emperor, with his usual liberality, has provided a large and splendid edifice in Vienna, which affords habitation both for the teachers, the students, pregnant women, patients for clinical lectures and servants. He has also purchased for the use of this academy a medical library, which is open every day: a complete set of chirurgical instruments; an apparatus for experiments in natural philosophy; a collection of natural history; a number of anatomical and pathological preparations; a collection of preparations in wax brought from Florence; and a variety of other useful articles. Adjoining to the building also there is a good botanical garden.

Among other parts of this institution, three prize-medals, each of the value of 40 florins, are to be annually bestowed on those students who return the best answer to questions proposed the year before. These prizes are not entirely founded by the emperor, but are in part owing to the liberality of Brendellius the protochirurgus at Vienna.

III. *Ecclesiastical Academies*; as that of Bologna in Italy instituted in 1687, employed in the examination of the doctrine, discipline, and history, of each age of the church.

IV. *Cosmographical Academies*; as that at Venice, called the *Argonauts*. This was instituted at the solicitation of F. Coronelli, for the improvement of geographical knowledge. Its design was to publish exact maps, both celestial and terrestrial, as well par-

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ticular-

Academy.

ticular as general, together with geographical, historical, and astronomical descriptions. Each member, in order to defray the expence of such a publication, was to subscribe a proportional sum, for which they were to receive one or more copies of each piece published. For this end three societies are settled; one under F. Moro, provincial of the minorities in Hungary; another under the abbot Laurence au Rue Payenne au Marais; the third under F. Baldigiani, Jesuit, professor of mathematics in the Roman college. The device of this academy is the terraqueous globe, with the motto *Plus ultra*; and at its expence all the globes, maps, and geographical writings, of F. Coronelli have been published.

V. *Academies of* SCIENCES.—These comprehend such as are erected for improving natural and mathematical knowledge. They are otherwise called *Philosophical* and *Physical* academies.

The first of these was instituted at Naples, about the year 1560, in the house of Baptista Porta. It was called the Academy *Secretorum Naturæ*; and was succeeded by the Academy of *Lyncei*, founded at Rome by Prince Frederic Cesi, towards the end of that century. Several of the members of this academy rendered it famous by their discoveries; among these was the celebrated Galileo. Several other academies were instituted about that time, which contributed greatly to the advancement of the sciences; but none of them comparable to that of the *Lyncei*.

Some years after the death of Toricelli, the *Academy del Cimento* made its appearance, under the protection of Prince Leopold, afterwards Cardinal de Medicis. Redi was one of its chief members; and the studies pursued by the rest may be collected from those curious experiments published in 1667, by their secretary Count Laurence Magulotti, under the title of *Saggi di Naturali Esperienze*; a copy of which was presented to the Royal Society, translated into English by Mr Waller, and published at London in 4to.

The *Academy degl' Inquieti*, afterwards incorporated into that of Della Tracia in the same city, followed the example of that of Del Cimento. Some excellent discourses on physical and mathematical subjects, by Geminiano Montenari, one of the chief members, were published in 1667, under the title of *Persieri Fisico Matematici*.

The *Academy of Rossano*, in the kingdom of Naples, was originally an academy of Belles Letters; founded in 1540, and transformed into an Academy of Sciences in 1695 at the solicitation of the learned abbot Don Giacinto Gimma; who being made president, under the title of Promoter General thereof, gave them a new set of regulations. He divided the academists into the following classes: Grammarians, Rhetoricians, Poets, Historians, Philosophers, Physicians, Mathematicians, Lawyers, and Divines, with a class apart for Cardinals and persons of quality. To be admitted a member, a man must have some degrees in the faculty. The members are not allowed to take the title of *Academists* in the beginning of their books, without a written permission from their president, which is not granted till the work has been examined by the censors of the academy; and the permission is the greatest honour the academy can confer, as they thereby adopt the work, and are answerable for it against all criticisms that may be made upon it. To this law the president or promoter himself is subject; and no academist is allowed to publish any thing against the writings of another without leave from the society.

Several other Academies of *Sciences* have been founded in Italy; but, for want of being supported by princes, did not continue long. The loss of them, however, was abundantly repaired by the institution of others still subsisting; such as, the *Academy of Filarmonici* at Verona; of *Ricovatri* at Padua, where a learned discourse on the origin of springs was delivered by Sig. Vallisnieri, first professor of physic in the university of that city, and which was afterwards printed. To the Academy of the *Muti de Reggio*, at Modena, the same Sig. Vallisnieri presented an excellent discourse on the scale of created beings, since inserted in his history of the generation of man and animals printed at Venice in the year 1721.

F. Mersenne is said to have given the first idea of a philosophical academy in France, towards the beginning of the 17th century, by the conferences of naturalists and mathematicians occasionally held at his lodgings; at which Gassendi, Des Cartes, Hobbes, Roberval, Pascal, Blondel, and others assisted. F. Mersenne proposed to each certain problems to examine, or certain experiments to be made. These private assemblies were succeeded by more public ones, formed by Mr Montmort, and Mr Thevenot the celebrated traveller. The French example animated several Englishmen of distinction and learning to erect a kind of philosophical academy at Oxford, towards the close of Oliver Cromwell's administration; which, after the restoration, was erected into a Royal Society. See SOCIETY. The English example, in its turn, animated the French. Lewis XIV. in 1666, assisted by the counsels of Mr Colbert, founded an academy of sciences at Paris, with a sufficient revenue to defray the charge of experiments, and salaries to the members.

Royal Academy of Sciences. After the peace of the Pyrenees, Lewis XIV. being desirous of establishing the arts, sciences, and literature, upon a solid foundation, directed M. Colbert to form a society of men of known abilities and experience in the different branches, who should meet together under the king's protection, and communicate their respective discoveries. Accordingly Mr Colbert, having conferred with those who were at that time most celebrated for their learning, resolved to form a society of such persons as were conversant in natural philosophy and mathematics, to join to them other persons skilled in history and other branches of erudition, along with those who were entirely engaged in what are called the *Belles Lettres*, grammar, eloquence, and poetry. The geometricians and natural philosophers were ordered to meet on Tuesdays and Saturdays, in a great hall of the king's library, where the books of mathematics and natural philosophy were contained; the learned in history to assemble on Mondays and Tuesdays, in the hall where the books of history are contained; and the class of Belles Letters to assemble on Wednesdays and Fridays. All the different classes were likewise ordered to meet together upon the first Tuesday of every month; and, by their respective secretaries, make a report of the proceedings of the foregoing month.

In a short time, however, the classes of History, Belles

 Belles Lettres, &c. were united to the *French* Academy, which was originally instituted for the improvement and refining the French language; so that the royal Academy contained only two classes, *viz.* that of natural philosophy and mathematics.

In the 1696, the king, by a proclamation dated the 26th of January, gave this Academy a new form, and put it upon a more respectable footing.—It was now to be composed of four kinds of members, viz. *honorary, pensionary, associates*, and *eleves*. These last were a kind of pupils, or scholars, each of whom was attached to one of the pensionaries. The first class to contain ten persons, and each of the rest twenty. The honorary academists to be all inhabitants of France; the pensionaries all to reside at Paris; eight of the associates allowed to be foreigners; and the eleves all to live at Paris. The officers to be, a president named by the king, out of the class of honorary academists; and a secretary and treasurer to be perpetual. Of the pensionaries, three to be geometricians, three astronomers, three mechanics, three anatomists, three chemists, three botanists, and the remaining two to be secretary and treasurer. Of the twelve associates, two to apply themselves to geometry, two to botany, and two to chemistry. The eleves to apply themselves to the same kind of science with the pensionaries they were attached to; and not to speak except when called by the president. No regular or religious to be admitted, except into the class of honorary academists; nor any person to be admitted either for associate or pensionary, unless known by some considerable printed work, some machine, or other discovery. The assemblies were held on Wednesdays and Saturdays, unless either of them happened to be a holiday, and then the assembly was held on the preceding day.—To encourage the members to pursue their labours, the king engaged not only to pay the ordinary pensions, but even to give extraordinary gratifications, according to the merit of their respective performances; furnishing withal the expence of the experiments and other inquiries necessary to be made. If any member gave in a bill of charges of experiments he had made, or desiring the printing of any book, and brought in the charges of graving, the money was immediately paid by the king, upon the president's allowing and signing the bill. So, if an anatomist required live tortoises, for instance, for making experiments about the heart, &c. as many as he pleased were brought him at the king's charge. Their motto was, *Invenit et perfecit*.

In the year 1716, the duke of Orleans, then regent, made an alteration in their constitution; augmenting the number of honoraries, and of associates capable of being foreigners, to 12; admitting regulars among such associates; and suppressing the class of eleves, as it appeared to be attended with some inconveniences, particularly that of making too great an inequality among the chemists, and being productive of some misunderstandings and animosities among the members. At the same time he created other two classes; one consisting of 12 adjuncts, who, as well as the associates, were allowed a deliberative voice in matters relative to science; and the other six free associates, who were not attached to any particular science, nor obliged to pursue any particular work.

Since its re-establishment in 1696, this academy has been very exact in publishing, every year, a volume containing either the works of its own members, or such memoirs as have been composed and read to the academy during the course of that year. To each volume is prefixed the history of the academy, or an extract of the memoirs, and, in general, of whatever has been read or said in the academy; at the end of the history, are the eulogiums on such academists as have died that year.—M. Rouille de Meslay, counsellor to the parliament of Paris, founded two prizes, one of 2500, and the other of 2000 livres, which are alternately distributed by the parliament every year; the subject for the first must relate to physical astronomy, and those for the latter to navigation and commerce.

Notwithstanding the advantages which the members of this academy enjoy over others, in having their expences defrayed, and even being paid for their time and attendance, they have fallen under some imputations, particularly that of plagiarism, or borrowing their neighbour's inventions; but with what justice we do not say.

The French have also considerable academies in most of their great cities: as, at Montpelier, a royal academy of sciences on the like footing as that at Paris, being as it were a counter part thereof; at Thoulouse, an academy under the denomination of Lanternists; others at Nismes, Arles, Lyons, Dijon, Bourdeaux, &c.

The Royal Academy of Sciences at Berlin was founded in 1700, by Frederic II. king of Prussia, on the model of that of England; excepting that, besides natural knowledge, it likewise comprehends the Belles Lettres. In 1710, it was ordained that the president shall be one of the counsellors of state, and nominated by the king. The members were divided into four classes; the first for prosecuting physics, medicine, and chemistry; the second for mathematics, astronomy, and mechanics; the third for the German language and the history of the country; the fourth for oriental learning, particularly as it may concern the propagation of the gospel among infidels. Each class to elect a director for themselves, who shall hold his post for life. The members of any of the classes have free admission into the assemblies of any of the rest.

The great promoter of this institution was the celebrated Mr Leibnitz, who accordingly was made the first director. The first volume of their transactions was published in 1710, under the title of *Miscellanea Berolinensia*; and though they received but few marks of the royal favour for some time, they continued to publish new volumes in 1723, 1725, 1734, and 1740. At last, however, Frederic III. the late king of Prussia, gave new vigour to this academy, by inviting to Berlin such foreigners as were most distinguished for their merit in literature, and encouraged his subjects to prosecute the study and cultivation of the sciences by giving ample rewards; and thinking that the academy, which till that time had had some minister or opulent nobleman for its president, would find an advantage in having a man of letters at its head, he conferred that honour on M. Maupertuis. At the same time, he gave a new regulation to the academy, and took upon himself the title of its protector.

The academists hold two public assemblies annually; one in January, on the late king's birth-day; and the other

other in May, on the day of his acceffion to the throne. At the latter of thefe is given, as a prize, a gold medal of 50 ducats value: the fubject for this prize is fucceffively, natural philofophy, mathematics, metaphyfics, and erudition.

The Imperial Academy of Sciences at Peterfburgh was projected by Czar Peter the Great. That great monarch having, during his travels, obferved the advantage of public focieties for the encouragement and promotion of literature, formed the defign of founding an academy of fciences at St Peterfburgh. By the advice of Wolf and Leibnitz, whom he confulted on this occafion, the fociety was regulated, and feveral learned foreigners were invited to become members. Peter himfelf drew the plan, and figned it on the 10th of Feb. 1724; but was prevented, by the fuddennefs of his death, from carrying it into execution. His deceafe, however, did not prevent its completion: for on the 21ft of December 1725, Catharine I. eftablifhed it according to Peter's plan; and on the 27th of the fame month the fociety was firft affembled. On the 1ft of Auguft 1726, Catharine honoured the meeting with her prefence, when profeffor Bulfinger, a German naturalift of great eminence pronounced an oration upon the advances made by the loadftone and needle for the difcovery of the longitude.

The emprefs fettled a fund of 4982l. *per annum* for the fupport of the academy; and fifteen members, all eminent for their learning and talents, were admitted and penfioned, under the title of Profeffors, in the various branches of literature and fcience. The moft diftinguifhed of thefe profeffors were Nicholas and Daniel Bernouilli, the two De Lifles, Bulfinger, and Wolf.

During the fhort reign of Peter II. the falaries of the members were difcontinued, and the academy was utterly neglected by the court; but it was again patronized by the emprefs Anne, who even added a feminary for the education of youth, under the fuperintendance of the profeffors. Both inftitutions flourifhed for fome time under the direction of Baron Korf; but upon his death, towards the latter end of Anne's reign, an ignorant perfon being appointed prefident, many of the moft able members quitted Ruffia. At the acceffion of Elizabeth, new life and vigour were again reftored to the academy: the original plan was enlarged and improved; fome of the moft learned foreigners were again drawn to Peterfburgh; and, what was confidered as a good omen for the literature of Ruffia, two natives, Lomonofof and Rumovfky, men of genius and abilities, who had profecuted their ftudies in foreign univerfities, were enrolled among its members. The annual income was increafed to 10,659l. and foon afterwards the new inftitution took place.

The prefent emprefs Catharine III. with her ufual zeal for promoting the diffufion of knowledge, has taken this ufeful fociety under her more immediate protection. She has altered the court of directors greatly to the advantage of the whole body; fhe has corrected many abufes, and has infufed a new fpirit into their refearches. By her majefty's particular recommendation, the moft ingenious profeffors have vifited the various provinces of her vaft dominions; and as the fund of the academy was not fufficient to fupply the whole expence of thefe feveral expeditions, the emprefs beftowed a largefs of 2000l. which fhe has renewed as occafion has required.

The purpofe and intent of thefe travels will appear from the inftructions given by the academy to the feveral perfons who were engaged in them. They were ordered to purfue their inquiries upon the different forts of earths and waters; upon the beft methods of cultivating the barren and defart fpots; upon the local diforders incident to men and animals, and the moft efficacious means of relieving them; upon the breeding of cattle, and particularly of fheep; on the rearing of bees and filk-worms; on the different places and objects for fifhing and hunting; on minerals; on the arts and trades; and on forming a Flora Ruffica, or collection of indigenous plants: they were particularly inftructed to rectify the longitude and latitude of the principal towns; to make aftronomical, geographical, and meteorological obfervations; to trace the courfe of the rivers; to take the moft exact charts; and to be very diftinct and accurate in remarking and defcribing the manners and cuftoms of the different people, their dreffes, languages, antiquities, traditions, hiftory, religion; and, in a word, to gain every information which might tend to illuftrate the real ftate of the whole Ruffian empire.

In confequence of thefe expeditions, perhaps no country can boaft, within the fpace of fo few years, fuch a number of excellent publications on its internal ftate, on its natural productions, on its topography, geography, and hiftory; on the manners, cuftoms, and languages of the different people, as have iffued from the prefs of this academy.

The firft tranfactions of this fociety were publifhed in 1728, and intitled *Commentarii Academiæ Scientiarum Imperialis Petropolitanæ ad an.* 1726, with a dedication to Peter II. The publication was continued under this form until the year 1747, when its tranfactions were called *Novi Commentarii Academiæ*, &c. In 1777 the academy again changed the title into *Acta Academiæ Scientiarum Imperialis Petropolitanæ*, and likewife made fome alteration in the arrangement and plan of the work. The papers, which had been hitherto publifhed in the Latin tongue, are now written either in that language or French; and a preface is added, ftyled *Partie Hiftorique*, which contains an account of its proceedings, meetings, admiffion of new members, and other remarkable occurrences. Of the Commentaries, 14 volumes were publifhed: the firft of the New Commentaries made its appearance in 1750, and the twentieth in 1776. Under the new title of *Acta Academiæ*, feveral volumes have been given to the public, and two are printed every year. Thefe tranfactions abound with ingenious and elaborate difquifitions upon various parts of fcience and natural hiftory, and which reflect the greateft honour upon their authors; and it may not be an exaggeration to affert, that no fociety in Europe has more diftinguifhed itfelf for the excellence of its publications, and particularly in the more abftrufe parts of the pure and mixed mathematics.

The academy is ftill compofed, as at firft, of fifteen profeffors, befide the prefident and director. Each of thefe profeffors has a houfe and an annual ftipend from 200l. to 600l. Befide the profeffors, there are four adjuncts, who are penfioned, and who are prefent at the

the sittings of the society, and succeed to the first vacancies.—The direction of the academy is at present consigned to the Princess Dashkof.

The building and apparatus of this academy are extraordinary. There is a fine library, consisting of 36000 curious books and manuscripts.—There is an extensive museum, in which the various branches of natural history, &c. are distributed in different apartments: it is extremely rich in native productions, having been considerably augmented with a variety of specimens collected by Pallas, Gmelin, Guldenstaedt, and other learned professors, during their late expeditions thro' the Russian empire. The stuffed animals and birds occupy one apartment. The chamber of rarities, the cabinet of coins, &c. contain innumerable articles of the highest curiosity and value. The society has this motto, *Paulatim*.

The Academy of Sciences at Bologna, called the *Institute of Bologna*, was founded by count Marsigli in 1712, for the cultivating of physics, mathematics, medicine, chemistry, and natural history. Its history is written by M. de Limiers, from memoirs furnished by the founder himself.

The Academy of Sciences at Stockholm, or *Royal Swedish Academy*, owes its institution to six persons of distinguished learning, amongst whom was the celebrated Linnæus: they originally met on the 2d of June 1739, formed a private society, in which some dissertations were read; and in the latter end of the same year their first publication made its appearance. As the meeting continued and the members increased, the society attracted the notice of the king, and was, on the 31st of March 1741, incorporated under the name of the Royal Swedish Academy. Not receiving any pension from the crown, it is only under the protection of the king, being directed, like the Royal Society, by its own members. It has now a large fund, which has chiefly arisen from legacies and other donations; but a professor of experimental philosophy, and two secretaries, are still the only persons who receive any salaries. Each of the members resident at Stockholm becomes president by rotation, and continues in office during three months. There are two species of members, native and foreign: the election of the former is held in April, and of the latter in July: no money is paid at the time of admission. The dissertations read at each meeting are collected and published four times in the year; they are written in the Swedish language, and printed in octavo, and the annual publications make a volume. The first 40 volumes, which were finished in 1779, are called the Old Transactions; for in the following year the title was changed into that of New Transactions. The king is sometimes present at the ordinary meetings, and particularly at the annual assembly in April for the election of members. Any person who sends a treatise which is thought worthy of being printed, receives the transactions for that quarter *gratis*, and a silver medal, which is not esteemed for its value, being worth only three shillings, but for its rarity and the honour conveyed by it. All the papers relating to agriculture are put forth separately under the title of *Oeconomica acta*. Annual premiums, in money and gold medals, principally for the encouragement of agriculture and inland trade, are also distributed by the academy. The fund for these prizes is supplied from private donations.

The Royal Academy of Sciences at Copenhagen, owes its institution to the zeal of six literati, whom Christian VI. in 1742, ordered to arrange his cabinet of medals. The count of Holstein was the first president; and the six persons who first formed the design, were John Gram, Joachim Frederic Ramus, Christian Louis Scheid, Mark Woldickey, Eric Pontopidan, and Bernard Moelman. These persons occasionally meeting for that purpose, extended their designs; associated with them others who were eminent in several branches of science; and forming a kind of literary society, employed themselves in searching into, and explaining the history and antiquities of their country. The count of Holstein warmly patronized this society, and recommended it so strongly to Christian VI. that, in 1743, his Danish Majesty took it under his protection, called it the Royal Academy of Sciences, endowed it with a fund, and ordered the members to join to their former pursuits, natural history, physics, and mathematics. In consequence of the royal favour, the members engaged with fresh zeal in their pursuits; and the academy has published 15 volumes in the Danish language, some whereof have been translated into Latin.

American Academy of Sciences, was established in 1780 by the council and house of representatives in the commonwealth of Massachusett's Bay for promoting the knowledge of the antiquities of America, and of the natural history of the country; for determining the uses to which its various natural productions might be applied; for encouraging medicinal discoveries, mathematical disquisitions, philosophical inquiries and experiments, astronomical, meteorological, and geographical observations, and improvements in agriculture, manufactures, and commerce; and in short, for cultivating every art and science which may tend to advance the interest, honour, dignity, and happiness, of a free, independent, and virtuous people. The members of this academy are never to be more than 200, nor less than 40.

VI. *Academies or Schools of* ARTS; as that at Petersburgh, which was established by the empress Elizabeth, at the suggestion of count Shuvalof, and annexed to the academy of sciences: the fund was L.4000 per annum, and the foundation for 40 scholars. The present empress has formed it into a separate institution, enlarged the annual revenue to L.12,000, and has augmented the number of scholars to 300; she has also constructed, for the use and accommodation of the members, a large circular building, which fronts the Neva. The scholars are admitted at the age of six, and continue until they have attained that of 18: they are clothed, fed, and lodged, at the expence of the crown. They are all instructed in reading and writing, arithmetic, the French and German languages and drawing. At the age of 14 they are at liberty to choose any of the following arts, divided into four classes. 1. Painting in all its branches of history, portraits, battles and landscapes; architecture; Mosaic; enamelling; &c. 2. Engraving on copperplates, seal-cutting, &c. 3. Carving in wood, ivory and amber. 4. Watch-making, turning, instrument-making, casting statues in bronze and other metals, imitating gems and medals in paste and other

 other compositions, gilding and varnishing. Prizes are annually distributed to those who excel in any particular art; and from those who have obtained four prizes, twelve are selected, who are sent abroad at the charge of the empress. A certain sum is paid to defray their travelling expences; and when they are settled in any town, they receive an annual salary of L. 60. which is continued during four years. There is a small assortment of paintings for the use of the scholars; and those who have made great progress are permitted to copy the pictures in the empress's collection. For the purpose of design, there are models in plaster of the best antique statues in Italy, all done at Rome, of the same size with the originals, which the artists of the academy were employed to cast in bronze.

The Royal Academy of Arts in London, was instituted for the encouragement of *Designing, Painting, Sculpture*, &c. &c. in the year 1768. This academy is under the immediate patronage of the king, and under the direction of 40 artists of the first rank in their several professions. It furnishes, in winter, living models of different characters to draw after; and, in summer, models of the same kind to paint after. Nine of the ablest academicians are annually elected out of the 40, whose business is to attend by rotation, to set the figures, to examine the performance of the students, and to give them necessary instructions. There are likewise four professors, of *Painting*, of *Architecture*, of *Anatomy*, and of *Perspective*, who annually read public lectures on the subjects of their several departments; beside a president, a council, and other officers. The admission to this academy is free to all students properly qualified to reap advantage from the studies cultivated in it; and there is an annual exhibition of paintings, sculptures, and designs, open to all artists of distinguished merit.

The Academy of Painting and Sculpture at Paris. This took its rise from the disputes that happened between the master painters and sculptors in that capital; in consequence of which, M. Le Brun, Sarazin Corneille, and others of the king's painters, formed a design of instituting a particular academy; and having presented a petition to the king, obtained an arret dated Jan. 20. 1648. In the beginning of 1655, they obtained from cardinal Mazarin a brevet, and letters patent, which were registered in parliament; in gratitude for which favour they chose the cardinal for their protector, and the chancellor for their vice-protector. In 1663, by means of M. Colbert, they obtained a pension of 4000 livres. The academy consists of a protector; vice-protector; a director; a chancellor; four rectors; adjuncts to the rectors; a treasurer; four professors, one of which is professor of anatomy, and another of geometry; several adjuncts and counsellors, an historiographer, a scretary, and two ushers.

The Academy of Painting holds a public assembly every day for two hours in the afternoon, to which the painters resort either to design or to paint, and where the sculptors model after a naked person. There are 12 professors, each of whom keeps the school for a month; and there are 12 adjuncts to supply them in case of need. The professor upon duty places the naked man as he thinks proper, and sets him in two different attitudes every week. This is what they call *setting the model*. In one week of the month he sets two models together, which is called *setting the group*. The paintings and models made after this model, are called *academies* or *academy-figures*. They have likewise a woman who stands for a model in the public school. Every three months, three prizes for design are distributed among the *eleves* or disciples; two others for painting, and two for sculpture every year.

There is also an Academy of Painting, Sculpture, &c. at Rome, established by Lewis XIV. wherein those who have gained the annual prize at Paris are intitled to be three years entertained at the king's expence, for their further improvement.

The Academy of Architecture, established by M. Colbert in 1671, consisting of a company of skilful architects, under the diection of the superintendant of the buildings.

The Academy of Dancing, erected by Lewis XIV. with privileges above all the rest.

VII. *Academies of Law*; as that famous one at Beryta, and that of the Sitientes at Bologna.

VIII. *Academies of History*; as the *Royal Academy of Portuguese History at Lisbon*. This academy was instituted by king John V. in 1720. It consists of a director, four censors, a secretary, and 50 members; to each of whom is assigned some part of the ecclesiastical or civil history of the nation, which he is to treat either in Latin or Portuguese. In the church-history of each diocese, the prelates, synods, councils, churches, monasteries, academies, persons illustrious for sanctity or learning, places famous for miracles or relics, must be distinctly related in twelve chapters. The civil history comprises the transactions of the kingdom from the government of the Romans down to the present time. The members who reside in the country are obliged to make collections and extracts out of all the registers, &c. where they live. Their meetings to be once in 15 days.

A medal was struck by this academy in honour of their prince: the front of which was his effigy, with the inscription *Johannes V. Lusitanorum Rex*; and, on the reverse, the same prince is represented standing, and raising History almost prostrate before him, with the legend *Historia Resurges*. Underneath are the following words in abbreviature: REGia ACADemia HISToria LUSITanæ, INSTITuta VI. Idus Decembris MDCCXX.

Academy of Suabian History at Tubingen, was lately established by some learned men, for publishing the best historical writings, the lives of the chief historians, and compiling new memoirs, on the several points and periods thereof.

IX. *Academies of Antiquities*; as that at Cortona in Italy, and at Upsal in Sweden. The first is designed for the study of Hetrurian antiquities; the other for illustrating the northern languages, and the antiquities of Sweden, in which notable discoveries have been made by it. The head of the Hetrurian academy is called *Lucomon*, by which the ancients governors of the country were distinguished. One of their laws is to give audience to poets only one day in the year; another is to fix their sessions, and impose a tax of a dissertation on each member in his turn.

The Academy of Medals and Inscriptions at Paris was set on foot by M. Colbert, under the patronage of Lewis XIV. in 1663, for the study and explanation

of

of ancient monuments, and perpetuating great and memorable events, especially those of the French monarchy, by coins, relievos, inscriptions, &c. The number of members at first was confined to four or five, chosen out of those of the French academy; who met in the library of Mr Colbert, from whom they received his majesty's orders. The days of their meetings were not determined; but generally they met on Wednesdays, especially in the winter season: but, in 1691, the king having given the inspection of this academy to M. de Pontchartrain comptroller general, &c. he fixed their meetings on Tuesdays and Saturdays.

By a new regulation, dated the 16th of July 1701, the academy was composed of ten *honorary* members; ten *associates*, each of whom had two declarative voices; ten *pensionaries*; and ten *eleves*, or pupils. They then met every Tuesday and Wednesday, in one of the halls of the Louvre; and had two public meetings yearly, one the day after Martinmas and the other the 16th after Easter. The class of *eleves* has been suppressed, and united to the associates. The king nominates their president and vice-president yearly; but their secretary and treasurer are perpetual. The rest are chosen by the members themselves, agreeably to the constitutions on that behalf given them.

One of the first undertakings of this academy, was to compose by means of medals, a connected history of the principal events of Lewis XIV's reign: but in this design they met with great difficulties, and of consequence it was interrupted for many years; but at length it was completed down to the advancement of the duke of Anjou to the crown of Spain.

In this celebrated work, the establishment of the academy itself was not forgot. The medal on this subject represents Mercury sitting, and writing with an antique stylus on a table of brass, he leans with his left hand upon an urn full of medals, and at his feet are several others placed upon a card: the legend, *Rerum gestarum fides;* and on the exergue, *Academia regia inscriptionum et numismatum, instituta* M.DC.LXIII. signifying that the Royal Academy of medals and Inscriptions, founded in 1663, ought to give to future ages a faithful testimony of all great actions. Besides this work, we have several volumes of their memoirs; and their history, written and continued by their secretaries.

X. *Academies of* BELLES LETTRES, are those wherein eloquence and poetry are chiefly cultivated. These are very numerous in Italy, and not uncommon in France.

The Academy of Umidi at Florence has contributed greatly to the progress of the sciences by the excellent Italian translations given, by some of its members, of the ancient Greek and Latin historians. Their chief attention is to the Italian poetry, at the same time that they have applied themselves to the polishing of their language, which produced the *Academy del la Crusca.*

The Academy of Humorists, Umoristi, had its origin at Rome from the marriage of Lorenzo Marcini, a Roman gentleman; at which several persons of rank were guests; and, it being carnival time, to give the ladies some diversion, they took themselves to the reciting of verses, sonnets, speeches, first *ex tempore,* and afterwards premeditately; which gave them the denomination of *Belli Humori* After some experience, coming more and more into the taste of these exercises, they resolved to form an Academy of Belles Lettres; and changed the title of *Belli Humori* for that of *Humoristi:* choosing for their device, a cloud, which, after being formed of exhalations from the salt waters of the ocean, returns in a gentle sweet shower; with this motto from Lucretius *Redit agmine dulci.*

In 1690, the *Academy of Arcadi* was established at Rome, for reviving the study of Poetry and of the Belles Lettres. Besides most of the politer wits of both sexes in Italy, this academy comprehends many princes, cardinals, and other ecclesiastics; and, to avoid disputes about pre-eminence, all appear masked after the manner of Arcadian shepherds. Within ten years from its first establishment, the number of *Academists* amounted to six hundred. They hold assemblies seven times a-year in a mead or grove, or in the gardens of some noblemen of distinction. Six of these meetings are employed in the recitation of poems and verses of the Arcadi residing at Rome; who read their own compositions; except ladies and cardinals, who are allowed to employ others. The seventh meeting is set apart for the compositions of foreign or absent members.

This academy is governed by a Custos, who represents the whole society, and is chosen every four years, with a power of electing 12 others yearly for his assistance. Under these are two sub-custodes, one vicar or pro-custos, and four deputies or superintendants, annually chosen. The laws of the society are immutable, and bear a near resemblance to the ancient model.

There are five manners of electing members. The first is by *acclamation.* This is used when sovereign princes, cardinals, and ambassadors of kings, desire to be admitted; and the votes are then given *viva voce.* The second is called *annumeration.* This was introduced in favour of ladies and academical colonies, where the votes are taken privately. The third *representation,* was established in favour of colonies and universities, where the young gentry are bred; who have each a privilege of recommending one or two members privately to be balloted for. The fourth, *surrogation;* whereby new members are substituted in the room of those dead or expelled. The last, *destination* whereby, when there is no vacancy of members, persons of poetical merit have the title of Arcadi confered upon them till such time as a vacancy shall happen. All the members of this body, at their admission, assume new pastoral names, in imitation of the shepherds of Arcadia. The academy has several colonies of Arcadi in different cities of Italy, who are all regulated after the same manner.

XI. *Academies of* LANGUAGES; called, by some, *Grammatical Academies:* as.

The Academy della Crusca at Florence, famous for its vocabulary of the Italian tongue, was formed in 1582, but scarce heard of before the year 1584, when it became noted for a dispute between Tasso and several of its members. Many authors confound this with the Florentine academy. The discourses which Toricelli, the celebrated disciple of Galileo, delivered in the assemblies, concerning levity, the wind, the power of percussion, mathematics, and military architecture, are a proof

proof that these academists applied themselves to things as well as words.

The Academy of Fructiferi had its rise in 1617, at an assembly of several princes and nobility of the country, who met with a design to refine and perfect the German tongue. It flourished long under the direction of princes of the empire, who were always chosen presidents. In 1668 the number of members arose to upwards of 900. It was prior in time to the French academy, which only appeared in 1629, and was not established into an academy before the year 1635. Its history is written in the German tongue by George Neumarck.

The French Academy, which had its rise from a meeting of men of letters in the house of M. Conrart, in 1629. In 1635, it was erected into an academy, by Cardinal Richlieu, for refining and ascertaining the French language and stile.—The number of its members are limited at 40; out of whom a director, chancellor, and secretary, are to be chosen: the two former hold their post for two months, the latter is perpetual. The members of this academy enjoy several privileges and immunities, among which is that of not being obliged to answer before any court but that of the king's household. They meet three times a-week in the Louvre; at breaking up, 40 silver medals are distributed among them, having on one side the king of France's head, and on the reverse, *Protecteur de l'Academie*, with laurel, and this motto, *A l'Immortalité*. By this distribution, the attendance of the *Academists* is secured, those who are present receiving the surplus otherwise intended for the absent. To elect or expel a member, at least 18 are required; nor can any be chosen unless he petition for it: by this expedient, the affront of refusals from persons elected is avoided. Religious are not admitted; nor can any noblemen, or person of distinction, be admitted on another footing than as a man of letters. None are to be expelled, except for base and dishonest practices; and there are but two instances of such expulsions, the first of M. Granier for refusing to return a deposit, the other of the Abbé Furetiere for plagiarism.——The design of this academy was to give not only rules, but examples, of good writing. They began with making speeches on subjects taken at pleasure, about 20 of which were printed. They met with great opposition from the parliament at their first institution; it being two years before the patents granted by the king would be registered. They have been severely satyrized, and their style has been ridiculed as enervating instead of refining the French language. They are also charged with having surfeited the world by flattery, and having exhausted all the topics of panegyric in praise of their founder; it being a duty incumbent on every member, at his admission, to make a speech in praise of the king, the cardinal, the chancellor Seguier, and the person in whose place he is elected. The most remarkable work of this academy is a dictionary of the French tongue; which, after 50 years spent in settling the words and phrases to be used in writing, was at last published in 1694.

The foundation of an *Academy* similar to the above, has been proposed at Petersburgh, by the learned princess Dashkof: it is to consist of 60 members. The plan has been approved by the empress, who has already given a fund for its support and establishment.

The Royal Spanish Academy at Madrid held its first meeting in July 1713, in the palace of its founder, the duke d'Escalona. It consisted at first of eight academists, including the duke; to which number 14 others were afterwards added, the founder being chosen president or director. In 1714, the king granted them his confirmation and protection. Their device is a crucible in the middle of the fire, with this motto, *Limpia, Fya, y da Esplendor*; "it purifies, fixes, and gives brightness." The number of members is limited to 24; the duke d'Escalona to be director for life, but his successors chosen yearly, and the secretary to be perpetual. Their object, as marked out by the royal declaration, was to cultivate and improve the national language: they were to begin with choosing carefully such words and phrases as have been used by the best Spanish writers; noting the low, barbarous, or obsolete ones; and composing a dictionary wherein these may be distinguished from the former.

XII. *Academies of* POLITICS; as that at Paris, consisting of six persons, who met at the Louvre, in the chamber where the papers relating to foreign affairs were lodged. But this academy proved of little service, as the kings of France were unwilling to trust any but their ministers with the inspection of foreign affairs.

For a further account of similar establishments, see the article SOCIETY.

ACADEMY is also a term for schools and other seminaries of learning among the Jews, where their rabbins and doctors instructed their youth in the Hebrew language, and explained to them the Talmud and the secrets of the caballa: Those of Tiberias and Babylon have been the most noted.

The Romans had a kind of military academies, established in all the cities of Italy, under the name of *Campi Martis*. Here the youth were admitted to be trained for war at the public expence. The Greeks, beside academies of this kind, had military professors called *Tactici*, who taught all the higher offices of war, &c. &c.

ACADEMY is often used to denote a kind of collegiate seminary, where youth are instructed in arts and sciences. There is one in Portsmouth for teaching navigation, drawing, &c.; another at Woolwich, for fortification, gunnery, &c.—Besides these, there are numerous academies, especially in London, for teaching mathematics, languages, writing, accounts, drawing, and other branches of learning.

The nonconformist ministers, &c. are bred up in private academies; as not approving the common university education. The principal of their academies are those in London, Daventry, and Warrington.

ACADEMY is likewise a name given to a riding-school, where young gentlemen are taught to ride the great horse, &c. and the ground allotted is usually called the *Manege*.

ACADEMY Figure, a drawing of a naked man or woman, taken from the life; which is usually done on paper with red or black chalk, and sometimes with pastils or CRAYONS. See ACADEMY, N° VI. par. 4. *supra*.

ACADIE, or ACADY, in geography, a name formerly given to Nova Scotia, or New Scotland. See *NOVA Scotia*.

ACÆNA, in antiquity, a Grecian measure of length, being a ten feet-rod, used in measuring their lands.

ACÆNA, in botany, a genus of the monogynia order belonging to the tetrandria claſs of plants; the characters of which are theſe: The *calyx* is a perianthium conſiſting of four leaves, which are ovate, concave, equal, and perſiſtent; there is no *corolla:* The *ſtamina* conſiſts of four equal middle-ſized filaments oppoſite to the calyx; the antheræ are quadrangular, twin, erect: the *piſtillum* has an inverſely-ovate hiſped germ; the ſtylus is ſmall, and inflected on one ſide; and the ſtigma is a ſmall thickiſh coloured membrane, divided into many ſegments: The *pericarpium* is an inverſely-ovated dry one-celled berry covered with prickles bent backwards: The *ſeed* is ſingle. There is only one ſpecies, a native of MEXICO.

ACAJOU, or CASHEW-NUT-TREE. See ANACARDIUM.

ACALANDRUS, a river falling into the bay of Tarentum, not far from the Metapontum, (Pliny, Strabo); now *Fiume de Roſito*.

ACALEPTIC, in ancient proſody, a complete verſe.

ACALYPHA, the THREE-SEEDED MERCURY, a genus of plants belonging to the monœcia monadelphia claſs. The characters of this genus are the following.—*Male flowers* crowded above the female ones: The *calyx* is a three or four-leaved perianthium, the leaflets roundiſh, concave, and equal: The *corolla* is wanting: The *ſtamina* have from 6 to 18 filaments, which are ſhort, crowded, and connected at the baſe; the antheræ are roundiſh.—*Female flowers* fewer, placed beneath, and received into a large divided involucrum: The *calyx* is a perianthium, conſiſting of three leaflets, which are concave, converging, ſmall, and perſiſtent: No *corolla:* The *piſtillum* has a roundiſh germen: the ſtyli are three, branchy, oftener tripartite, and long; the ſtigmata are ſimple: The *pericarpium* has a roundiſh triſulcated trilocular capſule, the valvulets gaping two ways: The *ſeeds* are ſolitary, roundiſh, and large.—This genus ranks in the 38th natural order, *Tricoccæ*. There are five ſpecies, all natives of Virginia.

ACAMANTIS (the ancient name of the iſland of Cyprus), taken from one of its promontories ſituated to the weſt, and called *Acamas*. Teos in Ionia was alſo called thus from Acamus the founder.

ACAMAS, ACAMANTIS (anc. geog.), the weſt promontory of the iſland of Cyprus, from whence it took its ancient name: now Cape *Piſanio* or *Epiſanio*, where formerly was a town of the ſame name, now a village called *Cruſocco*.

ACAMAS, ſon of Theſeus, followed the reſt of the Grecian princes to the ſiege of Troy; and was deputed, with Diomedes, to the Trojans, in order to get Helen reſtored. Laodice, Priam's daughter, fell in love with him, ſtole a night with him, and had a ſon by him called Munitus. He was one of the heroes who concealed themſelves in the wooden horſe. One of the tribes of Athens was called *Acamantides* from him, by the appointment of the oracle; and he founded a city in Phrygia Major, called *Acamantium*. Homer mentions two other heroes of this name; one a Thracian prince who came to ſuccour Priam, another a ſon of Antenor.

ACANACEOUS PLANTS, ſuch as are armed with prickles.

ACANGIS, that is, *Ravagers* or *Adventurers*; a name which the Turks give their huſſars or light-troops, who are generally ſent out in detachments to procure intelligence, haraſs the enemy, or ravage the country.

ACANTHA, in botany, the prickle of any plant; in zoology, a term for the ſpine or prickly fins of fiſhes.

ACANTHABOLUS, in ſurgery, an inſtrument for pulling thorns, or the like, out of the ſkin.

ACANTHINE, any thing reſembling or belonging to the herb acanthus. Acanthine garments, among the ancients, are ſaid to be made of the down of thiſtles; others think they were garments embroided in imitation of the acanthus.

ACANTHOPTERYGIOUS FISHES, a term uſed by Linnæus and others for thoſe fiſhes whoſe back-fins are hard, oſſeous, and prickly.

ACANTHOS, a town of Egypt, near Memphis, (Pliny); now *Biſalta*. Alſo a maritime town of Macedonia, to the weſt of mount Athos, a colony of Andrians, (Thucydides, Ptolemy); now *Eriſſo;* near which was ſhown Xerxes's ditch, of ſeven ſtadia, in order to ſeparate mount Athos from the continent, and convey his ſhips, without doubling Athos, into the Singitic Bay. *Acanthos*, is alſo a town of Epirus.

ACANTHUS, BEAR'S-BREECH, or *brank-urſine*, in botany: a genus of the angioſpermia order, belonging to the didynamia claſs of plants; and ranking in the 4th natural order, *Perſonatæ*. The generic characters are: The *calyx* is a perianthium with leaflets of three alternate pairs unequal and perſiſtent: The *corolla* is one-petal'd and unequal; the tubus very ſhort, cloſed with a beard; no upper-lip, the under-one very large, flat, ſtraight, very broad, three-lobed, and obtuſe: The *ſtamina* have four ſubulated filaments ſhorter than the corolla; the two ſuperior rather longer, recurvate, and incurved at the top; the antheræ are oblong, compreſſed, obtuſe, lateral, parallel, and villous before: the *piſtillum* has a conic germen; a filiform ſtylus, the length of the ſtamina; and two acute lateral ſtigmata: The *perianthium* is an acutely-ovated bilocular capſule, with a lateral partition: The *ſeeds* one or two, fleſhy and gibbous.

Species. 1. The mollis, or common bear's-breech, a native of Italy, is the ſort that is uſed in medicine, and is ſuppoſed to be the *mollis acanthus* of Virgil; and the leaves are famous for having given riſe to the capital of the Corinthian pillars. 2. The ſpinoſus, or prickly bear's-breech; the leaves of which are deeply jagged in very regular order, and each ſegment is terminated with a ſharp ſpine, as are alſo the footſtalks of the leaves and the empalement of the flower, which renders it troubleſome to handle them. 3. Ilicifolius, or ſhrubby bear's-breech, grows naturally in both the Indies. It is an evergreen ſhrub, which riſes about for feet high; and is divided into many branches, garniſhed with leaves like thoſe of the common holly, and armed with ſpines in the ſame manner: the flowers are white, and ſhaped like thoſe of the common acanthus, but ſmaller. 4. The nigra, or Portugal bear's-breech, with ſmooth ſinuated leaves of a livid green colour, was diſcovered in Portugal by Dr Juſſieu of the royal garden at Paris. 5. The middle bear's-breech, with entire leaves, having ſpines on their border, is ſuppoſed to be the acanthus of Dioſcorides.

Culture, &c. They are all perennial plants. The first and second species may be propagated either by seeds, or by offsets from the roots. The best way is to raise them from the seeds: which should be sown about the end of March, in a light soil. They are best dropped at distances into shallow drills, and covered three quarters of an inch with mould. When the plants are come up, the strongest should be marked, and the rest should be pulled up, that they may stand at a yard distance one from another. They require no other culture but to keep them clear from weeds. The third, fourth, and fifth sorts, are propagated only by seeds; which, as they do not ripen in Europe, must be obtained from the places in which they grow naturally: the plants are so tender, that they cannot be preserved out of the stove in northern countries.—The first species is the sort used in medicine. All the parts of it have a soft sweetish taste, and abound with a mucilaginous juice: its virtues do not seem to differ from those of althea and other mucilaginous plants.

ACANTHUS, in architecture, an ornament representing the leaves of the acanthus, used in the capitals of the Corinthian and Composite orders.

ACAPULCO, a considerable town and port in Mexico, on the South Sea. It has a fine harbour, from whence a ship annually sails to Manila in the Philippine islands, near the coast of China in Asia; and another returns annually from thence with all the treasures of the east Indies, such as diamonds, rubies, sapphires, and other precious stones; the rich carpets of Persia; the camphire of Borneo; the benjamin and ivory of Pegu and Cambodia, the silks, muslins, and calicoes, of the Mogul's country; the gold-dust, tea, china-ware, silk, and cabinets, of China and Japan; besides cinnamon, cloves, mace, nutmegs, and pepper; insomuch that this single ship contains more riches than many whole fleets. The goods brought to Acapulco are caried to the city of Mexico by mules and pack-horses; and from thence to Vera Cruz on the North Sea, in order to be shipped for Europe. Acapulco itself is a small place, consisting about 2 or 300 thatched houses. Ships arrive at the port by two inlets, separated from each other by a small island: the entrance into them in the day-time is by means of a sea-breeze, as the sailing out in the night-time is effected by a land-breeze. A wretched fort, 42 pieces of cannon, and a garrison of 60 men, defend it. It is equally extensive, safe, and commodious. The bason which constitutes this harbour is surrounded by lofty mountains, which are so dry, that they are even destitute of water. The air here is hot, heavy, and unwholesome; to which none can habituate themselves, except certain negroes that are born under a similar climate, or some mulattoes. This feeble and miserable colony is crowded with a vast accession to its numbers upon the arrival of the galleons; traders flocking here from all the provinces of Mexico, who come to exchange European toys, their own cochineal, and about ten millions* of silver for spices, muslins, printed linens, silk, perfumes, and the gold works of Asia. W. Long. 102. 29. N. Lat. 17. 30.

* 437,500l Sterling.

ACARAI, a town of Paraguay in South America, built by the Jesuits in 1624. Long 116. 40. S. lat, 26′.

ACARAUNA, a small American fish, called by our sailors *the old-wife*. See LABRUS.

ACARNANIA, the first country of Free Greece, or Greece Proper, bounded on the west by the Sinus Ambracius, and separated from Ætolia by the river Achelous on the east, and by the Sinus Ambracius from Epirus. The people were called *Acarnanes*, denoting persons unshorn; other Etolians, to the east of the Achelous, being called *Curetes* (Homer) from being shorn. According to Lucian, they were noted for effeminancy and incontinence; hence the proverb, *Porcellus Acarnanius*. This country was famous for an excellent breed of horses; so that Ακαρνικος ιππος, is a proverbial saying for a thing excellent in its kind. It is now called *la Carniæ* and *il Despotato*.

ACARON, or ACCARON, a town of Palestine, called *Ekron* in scripture. It was the boundary of the Philistines to the north; stood at some distance from the sea, near Bethshemeih; and was famous for the idol of Baalzebub.

ACARUS, the TICK or MITE, a genus of insects belonging to the order of aptera, or such as have no wings. The acarus has eight legs; two eyes, one on each side of the head; and two jointed tentacula. The female is oviparous. Linnæus enumerates 35 species; of which some are inhabitants of the earth, some of waters; some live on trees, others among stones, and others on the bodies of other animals, and even under their skin. The description of a few of the most remarkable will here suffice.

1. The siro, or cheese-mite, is a very minute species. To the naked eye, these mites appear like moving particles of dust: but the microscope discovers them to be perfect animals, having as regular a figure, and performing all the functions of life as perfectly, as creatures that exceed them many times in bulk. The principal parts of them are the head, the neck, and the body. The head is small in proportion to the body; and has a sharp snout, and a mouth that opens and shuts like a mole's. They have two small eyes, and are extremely quicksighted; and when they have been once touched with a pin, you may easily perceive how cunningly they avoid a second touch. Their legs are each furnished at the extremity with two little claws, with which the animal very nicely takes hold of any thing. The hinder part of the body is plump and bulky; and ends in an oval form, from which there issue out a few exceeding long hairs. Other parts of the body are also beset with thin and long hairs. The males and females are easily distinguished in these little animals. The females are oviparous, as the louse and spider; and from their eggs the young are hatched in their proper form, without having any change to undergo afterwards. They are, however, when first hatched, extremely minute; and, in their growing to their full size, they cast their skins several times. These little creatures may be kept alive many months between two concave glasses, and applied to the microscope at pleasure. They are thus often seen *in coitu*, conjoined tail to tail; and this is performed by an incredibly swift motion. Their eggs, in warm weather, hatch in 12 or 14 days; but in winter they are much longer. These eggs are so small, that a regular computation shows, that 90 millions of them are not so large as a common pigeon's egg*. They are very voracious animals, and have often been seen to eat one another. Their manner of eating is by thrusting alternately one

* *Baker's Microscope*. p. 187.

Acarus. jaw forward and the other backward, and in this manner grinding their food; and after they have done feeding, they seem to chew the cud.—There are several varieties of this species found in different substances besides cheese; as in malt-dust, flour, oatmeal, &c. Those in malt-dust and oat-meal are much nimbler than the cheese-mites, and have more and longer hairs. There are also a sort of wandering mites, which range wherever there is any thing they can feed on: They are often seen in the form of a white dust, and are not suspected to be living creatures.—The mite is called by authors, simply, *Acarus*. It is an animal very tenacious of life, and will live months without food. Mr Lewenhoek † had one which lived 11 weeks on the point of a pin, on which he had fixed it for examining by his microscope.

† *Arcan. Nat.* tom. iv. p. 368.

2. The sanguisugus. The hinder part of the abdomen is crenated, the scutellum is oval and yellowish, and the beak is trifid. It is a native of America, and sticks so fast on the legs of travellers, sucking their blood, that they can hardly be extracted.

3. The telarius is of a greenish yellow colour. It has a small sting or weapon, with which it wounds the leaves of plants, and occasions them to fold backward. They are very frequently to be met with in the autumn, inclosed in the folded leaves of the lime-tree.

4. The exulcerans, or itch-acarus, is a very small species: its body is of a figure approaching to oval, and lobated; the head is small and pointed; its colour is whitish, but it has two dusky semicircular lines on the back. It has long setaceous legs, but the two first are short. It is found in the pustules of the itch: authors in general have supposed that it causes that disease; but others observe, that if this were so, it would be found more universally in those pustules. It is more probable that these only make a proper nidus for it. See, however, the article Itch.

5. The batatas is of a blood-colour, and a little rough; the fore pair of legs are as long as the body. It inhabits the potatoes of Surinam.

6. The ovinus, or sheep-tick, has a flat body, of a roundish figure, but somewhat approaching to oval, and of a yellowish white colour, and has a single large round spot on the back: the anus is visible in the lower part of the body; the thorax is scarce conspicuous; the head is very small and black; the mouth is bifid: the antennæ are of a clavated figure, and of the length of the snout; the legs are short and black. It is common on sheep, and its excrements stain the wool green: it will live in the wool many months after it is shorn from the animal.

7. The coleoptratorum, or acarus of insects, is extremely minute: its body is round, reddish, and covered with a firm and hard skin; the head is very small, the neck scarce visible; the legs are moderately long, the anterior pair longer than the others; it has a whiteness about the anus. It is frequent on the bodies of many insects, which it infests, as the louse does others; it runs very swiftly: the humble bee, and many other of the larger insects, are continually infested with it; but none so much as the common black beetle, which has thence been called the lousy beetle.

8. The baccarum, or scarlet tree-mite, is a small species: its body is roundish, and the back not at all flatted, as it is in many others; the skin is smooth, shining, and glossy; and the whole animal seems distended, and ready to burst; the colour is a bright red, but a little duskier on the sides than elsewhere: the head is very small, and the legs short; there is on each side a small dusky spot near the thorax, and a few hairs grow from different parts of the body. It is very common on trees, particularly on the currant, on the fruit of which we frequently see it running.

Acarus ‖ Acatery.

9. The longicornis, or red stone-acarus, is very small, and of a bright red colour; the body is round, and distended; the head is very small and pointed; the legs are moderately long, and of a paler red than the body: the antennæ are much longer than in any other species. It is frequent about old stone-walls and on rocks, and runs very nimbly. See Plate I.

10. The aquaticus is a small species: the body is of a figure approaching to an oval, and the back appears depressed; it is of a bright and strong scarlet colour. The head is small; the legs are moderately long and firm, and are of a paler red than the body. It is common in shallow waters, where it runs very swiftly along the bottom. Its diminutiveness hinders the beauty of its colours from being perceived, as they are not discernible without the microscope.

11. The holosericeus is a small species: its body is roundish, but a little approaching to oval; the back somewhat depressed: it is of a fine scarlet colour, and covered with a velvety down. The head is very small; the eyes are two, and very small; the legs are short and of a paler red, and there is a small black spot near the insertion of the anterior ones. It is very common under the surface of the earth, and sometimes on herbs and among hay. It is supposed to be poisonous if swallowed; but we do not seem to have any certain account of such an effect.

12. The longpipes is the largest of the acarus kind: its body is roundish, of a dusky brown on the back, with a duskier spot of a rhomboidal figure near the middle of it; the belly is whitish; the legs are extremely long and slender. On the back part of the head there stands a little eminence, which has on it a kind of double crest, formed as it were of a number of minute spines: the eyes are small and black, and are two in number. It is very common in pastures towards the end of summer. Ray and Lister call it *araneus crustatus longpipes*; Mouffet, *arneus longpipes*; and, notwithstanding its having but two eyes, it has been almost universally ranked among the spiders.

ACASTUS, in classic history, the son of Pelias king of Thessaly, and one of the most famous hunters of his time, married Hippolyta, who falling desperately in love with Peleus her son-in-law, and he refusing to gratify her wishes, she accused him to her husband of a rape; on which he slew them both.

ACATALECTIC, a term, in the ancient poetry, for such verses as have all their feet or syllables, in contradistinction to those that have a syllable too few.

ACATALEPSY, signifies the impossibility of comprehending something.—The distinguishing tenet of the Pyrrhonists was their asserting an absolute acatalepsy in regard to every thing.

ACATERY, or Accatry, anciently an officer of the king's household, designed for a check betwixt the clerks of the kitchen and the purveyors.

ACATHARISIA, in medicine, an impurity of the blood or humours.

ACATHISTUS, the name of a solemn hymn anciently sung in the Greek church on the Saturday of the fifth week of Lent, in honour of the Virgin, for having thrice delivered Constantinople from the invasions of the barbarous nations.

ACATIUM, in the ancient navigation, a kind of boat or pinnace used for military purposes. The *acatium* was a species of those vessels called *naves actuariæ, i. e.* such as were wrought with oars. It was sometimes made use of in battle. Strabo describes it as a privateer or private sloop.

ACAULIS, in botany, a term applied to certain plants, the flowers of which have no pedicule or stalk to support them, but rest immediately on the ground, such as the carline thistle, &c.

ACCA (St), bishop of Hagustaldt, or Hexham, in Northumberland, succeeded Wilfrid in that see in 709. He ornamented his cathedral in a most magnificent manner: he furnished it also with plate and holy vestments; and erected a noble library, consisting chiefly of ecclesiastical learning, and a large collection of the lives of the saints, which he was at great pains to procure.—He was accounted a very able divine, and was famous for his skill in church-music. He wrote several pieces: particularly, *Passiones Sanctorum*, the Sufferings of the Saints: *Pro illustrandis scripturis, ad Bedam*; for explaining the scriptures, addressed to Bede. He died in 740, having enjoyed the see of Hexham 31 years, under Egbert king of the Northumbrians.

ACCALIA, in Roman antiquity, solemn festivals held in honour of Acca Laurentia, Romulus's nurse: they were otherwise called LAURENTALIA.

ACCAPITARE, in law, the act of becoming vassal of a lord, or of yielding him homage and obedience. Hence,

ACCAPITUM, signifies the money paid by a vassal upon his admission to a feu.

ACCAPITUM, in ancient law, was used also to express the relief due to the chief lord. See RELIEF.

ACCEDAS AD CURIAM, in the English law, a writ lying, where a man has received, or fears, false judgment in an inferior court. It lies also for justice delayed, and is a species of the writ RECORDARE.

ACCELERATION, in mechanics, the increase of velocity in a moving body. Accelerated motion is that which continually receives fresh accessions of velocity. Acceleration stands directly opposed to *retardation*, which denotes a diminution of velocity.

ACCELERATION is chiefly used in physics, in respect of falling bodies, *i. e.* of heavy bodies tending towards the centre of the earth by the force of gravity. That natural bodies are accelerated in their descent, is evident from various considerations, both *à priori* and *posteriori*.—Thus, we actually find, that the greater height a body falls from, the greater impression it makes, and the more vehemently does it strike the subject plane, or other obstacle.

Various were the systems and opinions which philosophers produced to account for this acceleration. But the immediate cause of acceleration is now sufficiently obvious; the principle of gravitation, which determines the body to descend, determining it to be accelerated by a necessary consequence.

Suppose a body let fall from on high: the primary cause of its beginning to descend is doubtless the power of gravity; but when once the descent is commenced, that state becomes in some measure natural to the body; so that if left to itself, it would persevere in it for ever, even though the first cause should cease: as we see in a stone cast with the hand, which continues to move after it is left by the cause that gave it motion. But, beside the propensity to descend impressed by the first cause, and which of itself were sufficient to continue the same degree of motion, once begun, *in infinitum*; there is a constant accession of subsequent efforts of the same principle, gravity, which continues to act on the body already in motion, in the same manner as if it were at rest. Here, then, being a double cause of motion; and both acting in the same direction, viz. directly towards the centre of the earth; the motion they jointly produce must necessarily be greater than that of any one of them.—And the velocity thus increased having the same cause of increase still persisting, the descent must necessarily be continually accelerated.

The motion of a body ascending, or impelled upwards, is diminished or retarded from the same principle of gravity, acting in a contrary direction, in the same manner as a falling body is accelerated: See RETARDATION. A body thus projected upwards, rises till it has lost all its motion: which it does in the same time that a body falling would have acquired a velocity equal to that wherewith the body was thrown up. Hence the same body thrown up, will rise to the same height from which falling it would have acquired the velocity wherewith it was thrown up: And hence the heights which bodies thrown up with different velocities do ascend to, are to one another as the squares of those velocities.

ACCELERATION of Bodies of inclined Planes.—The same general law obtains here as in bodies falling perpendicularly: the effect of the plane is to make the motion slower; but the inclination being every where equal, the retardation arising therefrom will proceed equally in all parts, at the beginning and at the ending of the motion. See MECHANICS.

ACCELERATION of the Motion of Pendulums—The motion of pendulous bodies is accelerated in their descent; but in a less ratio than that of bodies falling perpendicularly. See MECHANICS and PENDULUM.

ACCELERATION of the Motion of Projectiles. See PROJECTILE.

ACCELERATION is also applied in the ancient astronomy, in respect of the fixed stars.—This acceleration was the difference between the revolution of the *primum mobile* and the solar revolution; which was computed at three minutes and 56 seconds.

ACCELERATION of the Moon, a term used to express the increase of the moon's mean motion from the sun, compared with the diurnal motion of the earth; so that it is now a little swifter than it was formerly. Dr Halley was the first who made this discovery; and he was led to it by comparing the ancient eclipses observed at Babylon with those observed by Albatennius in the ninth century, and some of his own time. He was not able to ascertain the quantity of this acceleration, because the longitudes of Bagdad, Alexandria, and Aleppo, where the observations were made, had not been

been accurately determined. But since his time, the longitude of Alexandria has been ascertained by Chazelles; and Babylon, according to Ptolemy's account, lies 50′ east from Alexandria. From these *data*, Mr Dunthorne compared several ancient and modern eclipses, with the calculations of them, by his own tables, and hereby verified Dr Halley's opinion; for he found that the same tables represent the moon's place more backward than her true place in ancient eclipses, and more forward than her true place in later eclipses; and thence justly inferred, that her motion in ancient times was slower; in later times quicker, than the tables give it. But he did not content himself with merely ascertaining the fact; he proceeded to determine the quantity of the acceleration; and by means of the most ancient eclipse of which any authentic account remains, observed at Babylon in the year before Christ 721, he concluded, that the observed beginning of this eclipse was not above an hour and three-quarters before the beginning by the tables; and therefore the moon's true place could precede her place by computation but little more than 50′ of a degree at that time. Admitting the acceleration to be uniform, and the aggregate of it as a square of the time, it will be at the rate of about 10′ in 100 years.

Dr. Long attributes the acceleration above described to one or more of these causes: either. 1. The annual and diurnal motion of the earth continuing the same, the moon is really carried round the earth with a greater velocity than heretofore: or, 2. The diurnal motion of the earth, and the periodical revolutions of the moon continuing the same, the annual motion of the earth round the sun is a little retarded; which makes the sun's apparent motion in the ecliptic a little slower than formerly, and consequently, the moon in passing from any conjunction with the sun, spends less time before she again overtakes the sun, and forms a subsequent conjunction: in both these cases, the motion of the moon from the sun is really accelerated, and the synodical month actually shortened. Or, 3. The annual motion of the earth, and the periodical revolution of the moon continuing the same, the rotation of the earth round its axis is a little retarded: in this case days, hours, minutes, seconds, &c. by which all periods of time must be measured, are of a longer duration; and consequently the synodical mouth will appear to be shortened, though it really contains the same quantity of absolute time as it always did. If the quantity of matter in the body of the sun be lessened by the particles of light continually streaming from it, the motion of the earth round the sun may become slower: if the earth increases in bulk, the motion of the moon round the earth may be quickened thereby. See ASTRONOMY.

ACCELERATOR, in anatomy, the name of two muscles of the penis, which serve for ejecting the urine or semen. See ANATOMY, *Table of the Muscles*.

ACCENDENTES, a lower order of ministers in the Romish church, whose office is to light and trim the candles.

ACCENDONES, in Roman antiquity, a kind of gladiators, whose office was to excite and animate the combatants during the engagement. The orthography of the word is contested: the first edition of Tertullian, by Rhenanus, has it *accedones*; an ancient manuscript, *accendones*. Aquinas adheres to the former, Pitiscus to the latter. The origin of the word, supposing it *accendones*, is from *accendo*, I kindle; supposing it *accedones*, from *accedo*, I accede, am added to. The former places their distinguishing character in enlivening the combat by their exhortations and suggestions; the latter supposes them to be much the same with what among us are called *seconds*, among the Italians, *patroni*: excepting that these latter only stand by to see the laws of the sword duly observed, without intermeddling to give advice or instruction.

ACCENSI, in the Roman armies, certain supernumerary soldiers, designed to supply the places of those who should be killed or anywise disabled. They were thus denominated, *quia accensebantur*, or *ad censum adjiciebanter*. Vegetius calls them *supernumerarii legionum*: Cato calls them *ferentarii*, in regard they furnished those engaged in battle with weapons, drink, &c. Though Nonnius suggests another reason of that appellation, viz. because they fought with stones, slings, and weapons *quæ ferruntur*, such as are thrown, not carried in the hand. They were sometimes also called *velitis*, and *velati*, because they fought clothed, but not in armour; sometimes *adscripticii*, and *adscriptivi*; sometimest *rorarii*. The *accensi*, Livy observes, were placed at the rear of the army, because no great matter was expected from them: they were taken out of the fifth class of citizens.

ACCENSI, in antiquity, denotes an inferior order of officers, appointed to attend the Roman magistrates, somewhat in the manner of ushers, serjeants, or tipstaves among us. They were thus called from *accire*, to send for; one part of their office being to call assemblies of the people, summon parties to appear and answer before the judges, &c.

ACCENSI, was also an appellation given to a kind of adjutants, appointed by the tribune to assist each centurion and decurion. In which sense, *accensus* is synonymous with *optio*. In an ancient inscription, given by á Torre, we meet ACCENSUS EQUITUM ROMANORUM: an office no where else heard of. That author suspects it for a corruption; and instead thereof reads A CCENSIBUS.

ACCENSION, the action of setting a body on fire; thus the accension of tinder is effected by striking fire with flint and steel.

ACCENT, in reading or speaking, an inflection of the voice, which gives to each syllable of a word its due pitch in respect of height or lowness. See READING. The word is originally Latin, *accentus*: a compound of *ad*, to; and *cano*, to sing. *Accentus*, *quasi*, *adcantus*, or *juxta cantum*. In this sense, accent is synonymous with the Greek τονος; the Latin *tenor*, or *tonor*; and the Hebrew טעם, *gustus*, taste.—For the doctrine of *Accents* in *Composition*, see Poetry, Part III. N° 103. 114.

ACCENT, among grammarians, is a certain mark or character placed over a syllable, to direct the stress of its pronunciation. We generally reckon three grammatical accents in ordinary use, all borrowed from the Greeks, viz. the *acute accent*, (´), which shows when the tone of the voice is to be raised. The *grave accent* (`), when the note or tone of the voice is to be depressed. The *circumflex accent* (˜ or ^), is composed of both the acute and the grave, and points out a kind of

Accent.

of undulation of the voice. The Latins have made the same use of these three accents.

The Hebrews have a grammatical, a rhetorical, and musical accent: though the first and last seem, in effect, to be the same; both being comprised under the general name of *tonic accents*, because they give the proper tone to syllables; as the rhetorical accents are said to be euphonic, because they tend to make the pronunciation more sweet and agreeable. There are four euphonic accents, and 25 tonic; of which some are placed above, and others below the syllables; the Hebrew accents serving not only to regulate the risings and fallings of the voice, but also to distinguish the sections, periods, and numbers of periods, in a discourse; and to answer the same purposes with the points in other languages. Their accents are divided into *emperors*, *kings*, *dukes*, *&c.* each bearing a title answerable to the importance of the distinction it makes. Their emperor rules over a whole phrase, and terminates the sense completely; answering to our point. Their king answers to our colon; and their duke to our comma. The king, however, occasionally becomes a duke, and the duke a king, as the phrases are more or less short. It must be noted, by the way, that the management and combination of these accents differ in Hebrew poetry from what they are in prose. The use of the tonic or grammatical accents has been much controverted: some holding that they distinguish the sense; while others maintain that they are only intended to regulate the music, or singing; alleging that the Jews sing, rather than read, the scriptures in their synagogues*. Be this, however, as it will, it is certain the ancient Hebrews were not acquainted with these accents. The opinion which prevails amongst the learned, is that they were invented about the sixth century, by the Jewish doctors of the school of Tiberias, called the *Massoretes*.

* Cooper, Dom. Mosaiac. Clav. p. 31.

As to the Greek accents, now seen both in manuscripts and printed books, there has been no less dispute about their antiquity and use than about those of the Hebrews. Isaac Vossius endeavours to prove them of modern invention; asserting, that anciently they had nothing of the kind, but only a few notes in their poetry, which were invented by Aristophanes the grammarian, about the time of Ptolemy Philopater; and that these were of musical, rather than grammatical use, serving as aids in the singing of their poems, and very different from those introduced afterwards. He also shows from several ancient grammarians, that the manner of writing the Greek accents in these days was quite different from that which appears in our books. The author of *La Methode Greque*, p. 546, observes, that the right pronunciation of the Greek language being natural to the Greeks, it was needless for them to mark it by accents in their writings: so that, according to all appearance, they only began to make use of them so low as the time in which the Romans, being curious to learn the Greek tongue, sent their children to study at Athens, thinking thereby to fix the pronunciation; and to facilitate it to strangers; which happened, as the same author observes, a little before Cicero's time. Wetstein, Greek professor at Basil, in a learned dissertation, endeavours to prove the Greek accents of an older standing. He owns that they were not always formed in the same manner by the ancients; but thinks that difference owing to the different pronunciation which obtained in the different parts of Greece. He brings several reasons, *à priori*, for the use of accents, even in the earliest days: as that they then wrote all in capital letters equidistant from each other, without any distinction either of words or phrases, which without accents could scarce be intelligible; and that accents were necessary to distinguish ambiguous words, and to point out their proper meaning; which he confirms from a dispute on a passage in Homer, mentioned by Aristotle in his *Poetics*, chap. v. Accordingly, he observes, that the Syrians, who have tonic, but no distinctive accents, have yet invented certain points, placed either below or above the words, to show their mood, tense, person, or sense.

Accent | Acceptation.

The use of accents, to prevent ambiguities, is most remarkably perceived in some eastern languages, particularly the Siamese and Chinese. Among the people of China, every word, or (which is the same thing) syllable, admits of five accents, as spoken more acurately or remissly; and thus stands for many different things. The same sound *ya*, according to the accent affixed to it, signifies *God*, a *wall*, *excellent*, *stupidity*, and a *goose*. The Chinese have but 330 spoken words in their language; but these being multiplied by the different accents or tones, which affect the vowels, furnish a language tolerably copious. By means hereof, their 330 simple sounds come to denote 1650 things; but this being hardly sufficient, they are encreased further by aspirates added to each word to double the number. The Chinese only reckon four *accents*: for which the missionaries use the following marks, *aá*, *â*, *à*, *ä*; to which they have added a fifth, thus, *ã*. They made a kind of modulation; wherein, prolonging the duration of the sound of the vowel, they vary the tone, raising and sinking it by a certain pitch of voice: so that their talking is a sort of music or singing. Attempts have been made to determine the quantity of the rise or fall in each accent by means of musical notes; but this is hard to effect, as being different in different persons. Hence the great difficulty of the language to foreigners; they are forced to sing most scrupulously: if they deviate ever so little from the accent, they say quite a different thing from what was intended. Thus, meaning to compliment the person you are talking to with the title *Sir*, you call him a beast with the same word, only a little varied in the tone. Magalhon makes the language the easier to learn on this account.—The Siamese are also observed to sing rather than talk. Their alphabet begins with six characters, all only equivalent to a K, but differently accented. For tho' in the pronunciation the accents are naturally on the vowels, yet they have some to diversify such of their consonants as are in other respects the same.

Accent, in music, is a certain enforcement of particular sounds, whether by the voice or instruments, generally used at the beginning of bars.

ACCEPTANCE, in law, a person's agreeing to offers made in bargaining, by which the bargain is concluded.

Acceptance, in the church of Rome, is put for receiving the pope's constitutions.

Acceptance, in commerce, is the subscribing, signing, and making one's self debtor for the sum contained in a bill of exchange or other obligation.

ACCEPTATION, in grammar, the sense or meaning wherein any word is taken.

ACCEPTER, or ACCEPTOR, the person who accepts a BILL of exchange, &c.

ACCEPTILATION, among civilians, an acquittance or discharge given by the creditor to the debtor without the payment of any value.

ACCESSIBLE, something that may be approached, or that access may be had to. Thus we say, Such a place is accessible on one side, &c.

ACCESSION, in law, is a method of acquiring property, by which, in things that have a close connection or dependence upon one another, the property of the principal thing draws after it the property of the accessory: Thus, the owner of a cow becomes likewise the owner of the calf. It sometimes likewise signifies consent or acquiescence.

ACCESSION, among physicians, is used for a paroxysm of a disease; among politicians, it signifies a prince's succeeding to the government upon the death of his predecessor.

ACCESSORY, or ACCESSARY, something that accedes, or is added to another more considerable thing; in which sense the word stands opposed to PRINCIPAL.

Accessory, or *Accessary*, in common law, is chiefly used for a person guilty of a felonious offence, not principally, but by participation: as, by advice, command, or concealment.

There are two kinds of *accessories: before* the fact, and *after* it.—The *first* is he who commands, or procures another to commit felony, and is not present himself; for if he be present, he is a principal. The *second* is he who receives, assists, or comforts any man that has done murder, or felony, whereof he has knowledge. A man may be also accessory to an accessory, by aiding, receiving, &c. an accessory in felony.

An accessory in felony shall have judgment of life and member, as well as the principal who did the felony; but not till the principal be first attainted, and convict, or outlawed thereon. Where the principal is pardoned without attainder, the accessory cannot be arraigned; it being a maxim in law, *Ubi non est principalis, non potest esse accessarius:* but if the principal be pardoned, or have his clergy after attainder, the accessory shall be arraigned; 4 and 5 W. et M. cap. 4. And by stat. 1 Anne, cap. 9. it is enacted, that where the principal is convicted of felony, or stands mute, or challenges above 20 of the jury, it shall be lawful to proceed against the accessory in the same manner as if the principal had been attainted; and notwithstanding such principal shall be admitted to his clergy, pardoned, or delivered before attainder. In some cases only, if the principal cannot be taken, then the accessory may be prosecuted for a misdemeanour, and punished by fine, imprisonment, &c. In the lowest and highest offences there are no accessories, but all are principals: as in riots, routs, forcible entries, and other trespasses, which are the lowest offences. So also in the highest offence, which is, according to the English law, high treason, there are no accessories.

Accessories, in petty treason, murder, and in felonies of several kinds, are not to have their clergy. There can be no accessory before the fact in manslaughter; because that is sudden and unprepensed.

Accessory Nerves, in anatomy, a pair of nerves, which, arising from the medulla in the vertebræ of the neck, ascend, and enter the skull, and pass out of it again with the par vagum, wrapped up in the same common integument, and after quitting them, are distributed into the muscles of the neck and shoulders. See ANATOMY.

ACCESSORY, among painters, an epithet given to such parts of an history-piece as serve chiefly for ornament, and might have been wholly left out: such as vases, armour, &c.

ACCI, *(anc. geog.)* a town of Tarraconensis, formerly called *Acti;* supposed to be *Guadix*, to the east of the city of Granada, at the foot of a mountain, near the source of the rivulet Guadalantin; now greatly decayed. It is the Colonia Accitania Gemella, and was of some repute among the Roman colonies. The people were called Gemellenses, because the colony consisted of colonists from the third and sixth legions.

ACCIAIOLI (Donata), a man famous for his learning and the honourable employments he possessed in Florence his native country, in the 15th century. He wrote, A Latin translation of some of Plutarch's Lives; Commentaries on Aristotle's Ethics and Politics; and the life of Charlemagne. He was sent to France by the Florentines, to sue for succour from Lewis XI. against Pope Sextus IV. but on his journey died at Milan; his body was carried to Florence, and buried in the church of the Carthusians. The small fortune he left his children is a proof of his probity and disinterestedness. His daughters, like those of Aristides, were married at the public expence, as an acknowledgement of his services. His funeral eulogium was spoken by Christopher Landini; and an elegant epitaph, by Politian, was inscribed on his tomb.

ACCIDENT, in a general sense, denotes any casual accident.

ACCIDENT, among logicians, is used in a threefold sense. 1. Whatever does not essentially belong to a thing; as the clothes a man wears, or the money in his pocket. 2. Such properties in any subject as are not essential to it; thus whiteness in paper is an accidental quality. 3. In opposition to substance, all qualities whatever are called accidents; as sweetness, softness, *&c.*

ACCIDENT, in grammar, implies a property attached to a word, without entering into its essential definition; for every word, notwithstanding its signification, will be either primitive, derivative, simple, or compound, which are the accidents of words. A word is said to be primitive, when it is taken from no other word in the language in which it is used: thus *heaven, king, good*, are primitive words. It is said to be derivative, when it is taken from some other word: thus *heavenly, kingdom, goodness*, &c. are derivatives. A simple word is easily distinguished from a compound: thus *just, justice*, are simple words; *unjust, injustice*, are compound: *res* is a simple word, as well as *publica;* but *respublica* is a compound. Besides these accidents, which are common to all sorts of words, each particular species has its accidents: thus the accidents of the noun substantive are the gender, declension, and number; and the adjective has another accident, namely, the comparison. See the article GRAMMAR and LANGUAGE.

ACCIDENT, in heraldry, an additional point or mark in a coat of arms, which may be either omitted or retained without altering the essence of the armour; such as, abatement, difference, and tincture.

ACCIDENTAL, in a general ſenſe, implies ſomething that happens by accident, or that is not eſſential to its ſubject.

ACCIDENTAL, in philoſophy, is applied to that effect which flows from ſome cauſe intervening by accident, without being ſubject, or at leaſt without any appearance of its being ſubject, to general laws or regular returns. In this ſenſe, *accident* is oppoſed to *conſtant* and *principal*. Thus the ſun's place is, with reſpect to the earth, the conſtant and principal cauſe of the heat in ſummer, and the cold in winter; whereas winds, ſnows, and rains, are the accidental cauſes which often alter and modify the action of the principal cauſe.

ACCIDENTAL Point, in perſpective, is that point in the horizontal line where the projections of two lines, parallel to each other meet the perſpective plane.

ACCIDENTAL Colours, are thoſe which depend upon the affections of the eye, in contradiſtinction to thoſe which belong to the light itſelf. The impreſſions made upon the eye by looking ſtedfaſtly at a particular colour, are various, according to the ſingle colour or combination of colours in the object; and they continue for ſome time after the eye is withdrawn, and give a falſe colouring to other objects. Mr Buffon has endeavoured to trace the connections which theſe accidental colours have with ſuch as are natural, in a variety of inſtances. The ſubject has alſo been conſidered by De la Hire, and M. Epences; and M. d' Arcy has contrived a machine for determining the duration of the effects of light, and after ſeveral trials, finds that it continues about eight thirds of a minute.

ACCIPENSER, in ichthyology, a genus of fiſhes belonging to the Amphibia Nantes of Linnæus. The accipenſer has a ſingle linear noſtril: the mouth is in the under part of the head, and contains no teeth; the cirri are below the ſnout, and before the mouth. There are three ſpecies of this genus, *viz.*

1. The ruthenus has 4 cirri, and 15 ſquamous protuberances. It is a native of Ruſſia.

2. The huſo has 4 cirri; the body is naked, *i. e.* has no prickles or protuberances. The ſkin of the huſo is ſo tough and ſtrong, that it is employed for ropes in carts and other wheel-carriages; and the ichthyocolla, or ISINGLASS of the ſhops, famous as an agglutinant, and uſed alſo for the fining of wines, is made from its ſound or ſcales. The ancients were acquainted with the fiſh that afforded this drug. The huſo is the largeſt of the genus, and grows to 24 feet in length. It inhabits the Danube and the rivers of Ruſſia.

3. The ſturio, or ſturgeon, with 4 cirri and 11 ſquamous protuberances on the back. This fiſh annually aſcends the rivers in Britian, but in no great numbers, and is taken by accident in the ſalmon-nets. It ſeems a ſpiritleſs fiſh, making no manner of reſiſtance when entangled, but is drawn out of the water like a lifeleſs lump. It is ſeldom taken far out at ſea, but frequents ſuch parts as are not remote from the æſtuaries of great rivers. It is admired for the delicacy and firmneſs of its fleſh, which is white as veal, and extremely good when roaſted. It is generally pickled. A conſiderable quantity are annually ſent to Britain from America and the Baltic rivers. Great numbers are taken during ſummer in the lakes Friſchehaff, and Curiſch-haff near Pillau, in large nets made of ſmall cord. The adjacent ſhores are formed into diſtricts, and farmed out to companies of fiſhermen, ſome of which are rented for ſix thouſand guilders, near three hundred pounds, *per ann.* They are found in vaſt abundance in the American rivers in May, June, and July; at which time they leap ſome yards out of the water, and, falling on their ſides, make a noiſe to be heard in ſtill weather at a great diſtance. Caviare is made of the roes of this, and alſo of all the other ſorts of ſturgeons, dried, ſalted, and pickled up cloſe. Ichthyocolla, or iſinglaſs, is likewiſe made of the ſound of this fiſh, as well as that of the others; but in very ſmall quantity. The ſturgeon grows to a great ſize, to the length of 18 feet, and to the weight of 500 pounds. In the manner of breeding, this fiſh is an exception among the cartilaginous kind; being, like the bony fiſh, oviparous, ſpawning in water.

ACCIPITER, the name of Linnæus's firſt order of Birds. See ZOOLOGY.

Among the Romans, the term *accipiter* ſignified a hawk, and which, from its being very carnivorous, they are conſidered as birds of bad omen;

Odimus accipitrem, quia ſemper vivit in armis, OVID.

Pliny, however, tells us, that in ſome caſes, particularly in marriage, it was eſteemed a bird of good omen, becauſe it never eats the hearts of other birds; intimating thereby, that no differences in a married ſtate ought to reach the heart. The accipiter was worſhipped as a divinity by the inhabitants of Tentyra, an iſland in the Nile, being conſidered by them as the image of the ſun; and hence we find that luminary repreſented, in hieroglyphics, under the figure of a hawk.

ACCISMUS, denotes a feigned refuſal of ſomething which a perſon earneſtly deſires. The word is Latin; or rather Greek, Ακκισμος; ſuppoſed to be formed from *Acco*, the name of a fooliſh old woman noted in antiquity for an affectation of this kind.

Acciſmus is ſometimes conſidered as a virtue; ſometimes as a vice, which Auguſtus and Tiberius practiſed with great ſucceſs. Cromwell's refuſal of the crown of England may be brought as an inſtance of an Acciſmus.

ACCISMUS is more particularly uſed, in rhetoric, as a ſpecies of irony.

ACCITUM, (anc. geog.), a town of Hiſpania Batica, now *Finiana*, as appears from an ancient inſcription; ſituate on an eminence of the mountains Alpuxaras in Granada.

ACCIUS (Lucius), a Latin tragic poet, the ſon of a freedman, and, according to St Jerome, born in the conſulſhip of Hoſtilius Mancinus and Attilius Serranus, in the year of Rome 583; but there appears ſomewhat of confuſion and perplexity in this chronology. He made himſelf known before the death of Pacuvius, a dramatic piece of his being exhibited the ſame year that Pacuvius brought one upon the ſtage, the latter being then eighty years of age, and Accius only thirty. We do not know the name of this piece of Accius's, but the titles of ſeveral of his tragedies are mentioned by various authors. He wrote on the moſt celebrated ſtories which had been repreſented on the Athenian ſtage; as Andromache, Andromeda, Atreus, Clytemneſtra, Medea, Meleager, Philoctetes, the

Accius, Acclamation. the civil wars of Thebes, Tereus, the Troades, &c. He did not always, however, take his subjects from the Grecian story; for he composed one dramatic piece wholly Roman: it was intitled *Brutus*, and related to the explusion of the Tarquins. It is affirmed by some, that he wrote also comedies; which is not unlikely, if he was the author of two pieces, the Wedding and the Merchant, which have been ascribed to him. He did not confine himself to dramatic writing; for he left other productions, particularly his annals, mentioned by Macrobius, Priscian, Festus, and Nonnius Marcellus. He has been censured for writing in too harsh a style, but in all other respects has been esteemed a very great poet. He was so much esteemed by the public, that a comedian was punished for only mentioning his name on the stage. Cicero speaks with great derision of one Accius who had written a history; and, as our author had wrote annals, some insist that he is the person censured: but as Cicero himself, Horace, Quintilian, Ovid, and Paterculus, have spoken of our author with so much applause, we cannot think it is him whom the Roman orator censures with so much severity.

There was also in this age a pretty good orator of the same name, against whom Cicero defended Cluentius. He was born in Pisaurum, and perhaps was a relation of our poet.

ACCIUS, a poet of the 16th century, to whom is attributed *A Paraphrase of Æsop's Fables*, on which Julius Scaliger bestows great encomiums.

ACCLAMATION, a confused noise or shout of joy, by which the public express their applause, esteem, or approbation.

Acclamation, in a more proper sense, denotes a certain form of words, uttered with extraordinary vehemence, and in a peculiar tone somewhat resembling a song, frequent in the ancient assemblies. Acclamations were usually accompanied with applauses, with which they are sometimes confounded; though they ought to be distinguished; as acclamation was given by the voice, applause by the hands; add, that acclamation was also bestowed on persons absent, applause only on those present. Acclamation was also gived by women, whereas applause seems to have been confined to men.

Acclamations are of various kinds; ecclesiastical, military, nuptial, senatorial, synodical, scholastic, theatrical, &c. We meet with loud acclamations, musical, and rythmical acclamations; acclamations of joy and respect, and even of reproach and contumely. The former, wherein words of happy omen were used, were also called *Laudationes, et bona vota*, or good wishes; the latter, *Execrationes et convicia*. Suetonius furnishes an instance of this last kind in the Roman senate, on occasion of the decree for demolishing the statues of Domitian, when the fathers, as the historian represents it, could not refrain from contumelious acclamations of the deceased. The like were shown after the death of Commodus, where the acclamations run in the following strain: *Hosti patriæ honores detrahantur, parricidæ honores detrahantur; hostis statuas undique, parricidæ statuas undique, gladiatoris statuas undique*, &c.—The formula, in acclamations, was repeated sometimes a greater, sometimes a lesser, number of times. Hence we find in Roman writers *acclamatum est quinquies, et vicies;* five times, and twenty times: sometimes also *sexagies* and even *octuagies;* sixty and eight times.

Acclamations were not unknown on the theatres in the earliest ages of the Roman commonwealth; but they were artless then, and little other than confused shouts. Afterwards they became a sort of regular concerts. That mentioned by Phædrus, *Lætare incolumis Roma salvo principe*, which was made for Augustus, and proved the occasion of a pleasant mistake of a flute-player called *Princeps*, shows that musical acclamations were in use in that emperor's reign. *Revertentem ex Provincia modulatis carminibus prosequebantur*, says Suetonius, who gives another instance in the time of Tiberius: a false report of Germanicus's recovery being spread through Rome, the people ran in crowds to the capitol with torches and victims, singing, *Salva Roma, Salva Patria, Salvus est Germanicus.*—Nero, passionately fond of music, took special care to improve and perfect the music of acclamations. Charmed with the harmony wherewith the Alexandrians, who came to the games celebrated at Naples, had sung his praises, he brought several over to instruct a number of youth, chosen from among the knights and people, in the different kinds of acclamations practised at Alexandria. These continued in use as long as the reign of Theodoric. But the people did not always make a single chorus; sometimes there were two, who answered each other alternately: thus, when Nero played on the theatre, Burrhus and Seneca, who were on either hand, giving the signal by clapping, 5000 soldiers called Augustals, began to chant his praise, which the spectators were obliged to repeat. The whole was conducted by a music-master called *Mesochorus* or *Pausarius*.—The honour of acclamations was chiefly rendered to emperors, their children, and favourites; and to the magistrates who presided at the games. Persons of distinguished merit also sometimes received them, of which Quintilian gives us instances in Cato and Virgil. The most usual forms were, *Feliciter, Longiorem vitam, Annos felices*. The actors themselves, and they who gained the prizes in the games of the circus, were not excluded the honour of acclamations.

To theatrical acclamations may be added those of the soldiery and people in time of triumph. The victorious army accompanied their general to the capitol; and, among the verses they sung in his praises, frequently repeated, Io Triumphe, which the people answered in the same strain. It was also in the way of acclamation, that the soldiers gave their general the title of *Imperator*, after some notable victory: a title which he only kept till the time of his triumph.

The acclamations of the senate were somewhat more serious than the popular ones; but arose from the same principle, *viz.* a desire of pleasing the prince or his favourites; and aimed likewise at the same end, either to express the general approbation and zeal of the company, or to congratulate him on his victories, or to make him new protestations of fidelity. These acclamations were usually given after a report made by some senator, to which the rest all expressed their consent by crying Omnes, Omnes; or else, Æquum est, justum est. Sometimes they began with acclamations, and sometimes ended with them without other debates. It was after this manner that all the elections and proclamations of emperors, made by the senate, were conducted; something of which practice is still retained at modern elections of kings and emperors, where *Vivat Rex*

Rex, Vive le Roy, and *Long live the King*, are customary forms.

The Greeks borrowed the custom of receiving their emperors in the public places from the Romans. Luitprand relates, that at a procession where he was present, they sung to the emperor Nicephorus, πολλα ετη; that is, Many years: which Codin expresses thus, by το ψαλλειν το πολυχρονιον, or by το πολυχρονιζειν; and the wish or salutation by πολυχρονισμα. And at dinner, the Greeks then present wished with a loud voice to the emperor and Bradas, *Ut Deus annos multiplicet*; as he translates the Greek. Plutarch mentions an acclamation so loud, upon occasion of Flaminius's restoring liberty to Greece, that the very birds fell from heaven with the shout. The Turks practise something like this on the sight of their emperors and grand viziers to this day.

For the acclamations wherewith authors, poets, &c. were received, who recited their works in public; it is to be observed, the assemblies for this purpose were held with great parade in the most solemn places, as the capitol, temples, the Athenæum, and the houses of great men. Invitations were sent every where, in order to get the greater appearance. The chief care was, that the acclamations might be given with all the order and pomp possible. Men of fortune who pretended to wit, kept able applauders in their service, and lent them to their friends. Others endeavoured to gain them by presents and treats. Philostratus mentions a young man named Vavus, who lent money to the men of letters, and forgave the interest to such as applauded his exercises. These acclamations were conducted much after the same manner as those on the theatre, both as to the music and the accompaniments; they were to be suited both to the subject and to the person. There were particular ones for the philosophers, for orators, for historians, and for poets. It would be difficult to rehearse all the forms of them; one of the most usual was *Sophos*, which was to be repeated three times. Martial comprehends several other usual forms in this verse:

Graviter, Cito, Nequiter, Euge, Beate.

Neither the Greeks nor Romans were barren on this head. The names of gods and heroes were given those whom they would extol. It was not enough to do it after each head of discourse, chiefly after the exordium; but the acclamations were renewed at every fine passage, frequently at every period.

The acclamations wherewith the spectators honoured the victories of the athletæ, were a natural consequence of the impetuous motions which atended the gymnastic games. The cries and acclamations of the people, sometimes expressing their compassion and joy, sometimes their horror and disgust, are strongly painted by different poets and orators.

Acclamations made also a part of the ceremony of marriage. They were used for the omen's sake; being the *Læta Omina*, sometimes spoken of before marriage in Roman writers.

Acclamations, at first practised in the theatre, and passing thence to the senate, &c. was in process of time received into the acts of councils, and the ordinary assemblies of the church. The people expressed their approbation of the preacher variously; the more usual forms were, *Orthodox! Third Apostle*, &c. These acclamations being sometimes carried to excess, and often misplaced, were frequently prohibited by the ancient doctors, and at length abrogated; though they appear to have been in some use as low as the time of St Bernard.

Acclamation Medals, among antiquaries, such as represent the people expressing their joy in the posture of acclamation.

ACCLIVITY, the rise or ascent of a hill, in opposition to the declivity or descent of it. Some writers in fortification use it for the talus of a rampart.

ACCOLA, among the Romans, signified a person who lived *near* some place; in which sense, it differed from *incola*, the *inhabitant* of such a place.

ACCOLADE, a ceremony anciently used in the conferring of knighthood.

Antiquaries are not agreed wherein the accolade properly consisted. The generality suppose it to be the embrace, or kiss, which princes anciently gave the new knight, as a token of their affection: whence the word *accolade*; *q. d.* a clasping, or taking round the neck. Others will rather have it to be a blow on the chine of the neck, given on the same occasion. The Accolade is of some antiquity, in which soever of the two senses it be taken. Greg. de Tours writes, that the kings of France, even of the first race, in conferring the gilt shoulder-belt, kissed the knights on the left cheek. For the *accoleé*, or blow, John of Salisbury assures us, it was in use among the ancient Normans: by this it was that William the Conqueror conferred the honour of knighthood on his son Henry. At first, it was given with the naked fist; but was afterwards changed into a blow with the flat of the sword on the shoulder of the knight.

ACCOLEE, sometimes synonymous with Accolade, which see.—It is also used in various senses in heraldry: sometimes it is applied to two things joined; at other times, to animals with crowns, or collars about their necks, as the lion in the Ogilvy's arms; and, lastly, to kews, battons, maces, swords, &c. placed saltierwise behind the shield.

ACCOLTI (Bernardo), secretary to the republic of Florence, was surnamed L'Unico, or the Nonsuch, probably from the great extent of his understanding, the variety of sciences he had acquired, and the excellency of his poetic vein; which not only gained him a seat among the academicians of the court of Urbino, but made that great Mecænas, pope Leo X. in 1520, create him prince of the state of Nepi. He wrote many pieces; among others, a collection of beautiful poems, printed in Venice in 1519 and 1553.

ACCOMMODATION, the application of one thing, by analogy, to another; or the making two or more things agree with one another.

To know a thing by *accommodation*, is to know it by the idea of a similar thing referred thereto.

A prophecy of scripture is said to be fulfilled various ways; properly, as when a thing foretold comes to pass: and improperly, or by way of *accommodation*, when an event happens to any place or people, like to what fell out some time before to another.—Thus, the words of Isaiah, spoken to those of his own time; are said to be fulfilled in those who lived in our Saviour's; and are *accommodated* to them: "Ye hypocrites, well did Isaias prophecy of you," &c. which same words St Paul afterwards *accommodates* to the Jews of his time.

Accompaniment | Accomplishment.

The primitive church *accommodated* multitudes of Jewish, and even heathen ceremonies and practices, to Christian purposes; but the Jews had before done the same by the Gentiles: some will even have circumcision, the tabernacle, brazen serpent, &c. to have been originally of Egyptian use, and only *accommodated* by Moses to the purposes of Judaism*. Spencer maintains, that most of the rites of the old law were an imitation of those of the Gentiles, and particularly of the Egyptians; that God, in order to divert the children of Israel from the worship they paid to the false deities, consecrated the greatest part of the ceremonies performed by those idolaters, and had formed out of them a body of the ceremonial law; that he had indeed made some alterations therein, as barriers against idolatry; and that he thus *accommodated* his worship to the genius and occasions of his ancient people. To this condescension of God, according to Spencer†, is owing the origin of the tabernacle, particularly that of the ark. These opinions, however, have been controverted by later writers.

* Saurin. Diss. O. T. tom. i.

† De legib. Hebr. diss. i. l. 3. p. 32.

ACCOMPANIMENT, something attending or added as a circumstance to another, either by way of ornament, or for the sake of symmetry.

ACCOMPANIMENT, in music, denotes the instruments which accompany a voice, in order to sustain it, as well as to make the music more full. The accompaniment is used in recitative, as well as in song; on the stage, as well as in the choir, &c. The ancients had likewise their accompaniments on the theatre; they had even different kinds of instruments to accompany the chorus, from those which accompanied the actors in the recitation.—The accompaniment, among the moderns, is frequently a different part or melody from the song it accompanies. It is disputed whether it was so among the ancients. It is generally alleged, that their accompaniments went no farther than the playing in octave, or in antiphony to the voice. The Abbé Fraguier, from a passage in Plato, pretends to prove, that they had actual symphony, or music in parts: but his arguments seem far from being conclusive.

ACCOMPANIMENT, in painting, denotes such objects as are added, either by way of ornament, or probability; as dogs, guns, game, &c. in a hunting piece.

ACCOMPANIMENT, in heraldry, any thing added to a shield by way of ornament; as the belt, mantling, supporters, &c. It is also applied to several bearings about a principal one; as a saltier, bend, fess, chevron, &c.

ACCOMPLICE, one that has a hand in a business; or is privy in the same design or crime with another. See ACCESSORY.

By the law of Scotland, *the accomplice* can only be prosecuted after the conviction of the *principal* offender, unless the accession of the *accomplice* is immediate, in *ipso actu*, so as in effect to render them *co-principal*. By the general rule, the *accomplice* suffers the same punishment with the *principal* offender; yet if he be remarkably less guilty, justice will not permit equal punishment.

The council of Sens, and several other synodical statutes, expresly prohibit the revealing of *accomplices*.

ACCOMPLISHMENT, the entire execution or fulfilling of any thing.

ACCOMPLISHMENT, is principally used in speaking of events foretold by the Jewish prophets in the Old Testament, and fulfilled under the New. We say a literal accomplishment, a mystical or spiritual accomplishment, a single accomplishment, a double accomplishment, a Jewish accomplishment, a Christian, a heathen accomplishment. The same prophecy is sometimes accomplished in all, or in several of those different ways. Thus, of some of the prophecies of the Old Testament, the Jews find a literal accomplishment in their own history, about the time when the prophecy was given: the Christians find another in Christ, or the earliest days of the church; the heathens another, in some of their emperors; the Mahometans another, in their legislator, &c. There are two principal ways of accomplishing a prophecy; *directly*, and by *accommodation*. See ACCOMMODATION, and PROPHECY.

Accomplishment | Accountant

ACCOMPLISHMENT, is also used for any mental or personal endowment.

ACCORD, in painting, is the harmony that reigns among the lights and shades of a picture.

ACCORDS (Stephen Tabourot, seigneur des) advocate in the parliament of Dijon in France, and king's advocate in the bailiwic and chancery of that city, born in the year 1549. He was a man of genius and learning; but too much addicted to trifles, as appears from his piece, intitled, "Les Bigarrures," printed at Paris in 1582. This was not his first production, for he had before printed some sonnets. His work, intitled, "Les Touches," was published at Paris in 1585; which is indeed a collection of witty poems, but worked up rather in too loose a manner, according to the licentious taste of that age. His Bigarrures are written in the same strain. He was censured for this way of writing, which obliged him to publish an apology. The lordship of Accords is an imaginary fief or title from the device of his ancestors, which was a drum, with the motto, *à tous accords*, "chiming with all." He had sent a sonnet to a daughter of Mr Begat, the great and learned president of Burgundy, "who (says he) did me the honour to love me:—And inasmuch (continues he), I had subscribed my sonnet with only my device, *à tous accords*, this lady first nicknamed me, in her answer, *Seigneur des Accords*; by which title her father also called me several times. For this reason I chose this surname, not only in all my writings composed at that time, but even in these books." He died July 24th 1561, in the 46th year of his age.

ACCOUNT, or ACCOMPT, in a general sense, a computation or reckoning of any thing by numbers. Collectively, it is used to express the books which merchants, traders, bankers, &c. use for recording their transactions in business. See BOOK-KEEPING.

Chamber of ACCOUNTS, in the French polity, is a sovereign court of great antiquity, which takes cognisance of and registers the accounts of the king's revenue. It is nearly the same with the English *Court of Exchequer*.

ACCOUNT is taken sometimes, in a particular sense, for the computation of time: thus we say, The Julian Account, the Gregorian Account, *&c.* in which sense it is equivalent to *style*.

ACCOUNTANT, or ACCOMPTANT, in the most general sense, is a person skilled in accounts. In a more restricted sense, it is applied to a person, or officer, appointed to keep the accounts of a public company or office; as the South-sea.

ACCOUNTANTSHIP, the art of keeping and balancing accounts. See Book-keeping.

ACCOUNTANT-general, a new officer in the court of Chancery in Great Britain appointed by act of parliament to receive all moneys lodged in court instead of the masters, and convey the same to the bank of England for security.

ACCOUTREMENT, an old term, applied to the furniture of a soldier, knight, or gentleman.

ACCRETION, in physics, the increase, or growth of an organical body, by the accession of new parts. See Nutrition, Plants, and Vegetables.

Accretion, among civilians, the property acquired in a vague or unoccupied thing, by its adhering to or following another already occupied: thus, if a legacy be left to two persons, one of whom dies before the testator, the legacy devolves to the survivor by right of accretion.

ACCROCHE, in heraldry, denotes a thing's being hooked with another.

ACCUBATION, a posture of the body, between sitting and lying. The word comes from the Latin *accubare*, compounded of *ad*, to, and *cubo*, I lie down. *Accubation*, or *Accubitus*, was the table-posture of the Greeks and Romans; whence we find the words particularly use for the lying, or rather (as we call it) sitting down to meat. The Greeks introduced this posture. The Romans, during the frugal ages of the republic, were strangers to it: but as luxury got footing, this posture came to be adopted, at least by the men; for as to women, it was reputed an indecency in them to lie down among the men: though, afterwards, this too was got over. But children did not lie down, nor servants, nor soldiers, nor persons of meaner condition; but took their meals sitting, as a posture less indulgent. The Roman manner of disposing themselves at table was this: A low round table was placed in the cœnaculum, or dining-room; and, about this, usually three, sometimes only two, beds or couches; according to the number of which, it was called *biclinium* or *triclinium*. These were covered with a sort of bed-clothes, richer or plainer according to the quality of the person, and furnished with quilts and pillows, that the guests might lie the more commodiously. There were usually three persons on each bed; to crowd more, was esteemed sordid. In eating, they lay down on their left sides, with their heads resting on the pillows, or rather on their elbows. The first lay at the head of the bed, with his feet extended behind the back of the second; the second lay with the back of his head towards the navel of the first, only separated by a pillow, his feet behind the back of the third; and so of the third, or fourth. The middle place was esteemed the most honourable. Before they came to table, they changed their clothes, putting on what they called *cœnatoria vestis*, the dining-garment; and pulled off their shoes, to prevent fouling the couch.

ACCUBITOR, an ancient officer of the emperors of Constantinople, whose business was to lie near the emperor. He was the head of the youth of the bed-chamber, and had the *cubicularius* and *procubitor* under him.

ACCUMULATION, in a general sense, the act of heaping or amassing things together. Among lawyers, it is used in speaking of the concurrence of several titles to the same thing, or of several circumstances to the same proof.

Accumulation of Degrees, in an university, is the taking several of them together, or at smaller intervals than usual, or than is allowed by the rules of the university.

ACCURSED, something that lies under a curse, or sentence of excommunication.

In the Jewish idiom, *accursed* and *crucified* were synonymous. Among them, every one was accounted *accursed* who died on a tree. This serves to explain the difficult passage in Rom. ix. 3. where the apostle Paul wishes himself *accursed after the manner of Christ*, *i. e.* crucified, if happily he might by such a death save his countrymen. The proposition ἀπό here made use of, is used in the same sense, 2 Tim. i. 3. where it obviously signifies *after the manner of*.

ACCURSIUS, a law-professor in the 13th century, born in Florence. His authority was for some time so great, that he was called the Idol of the Lawyers. —Other three lawyers of note had the same name.

Accursius (Mariangelus), a famous critic of the 16th century, born at Aquilo in the kingdom of Naples. His Diatrebes, printed at Rome in folio, in 1524, on Ovid and Solinus, are a proof of his abilities in that kind of erudition. In his edition of Ammianus Marcellinus there are five books more than in any of the preceding ones; and he affirms he had corrected 5000 errors in that historian. His predominant passion was the searching for and collecting of old manuscripts: yet he made Latin and Italian verses; was complete master of the French, German, and Spanish tongues; and understood optics and music. He purged himself by oath, being charged for being a plagiary with regard to his Ausonius; it being reported, that he had appropriated to himself the labours of Fabricio Varana, bishop of Camerino.

ACCUSATION, the charging any person with a criminal action, either in one's own name, or in that of the public. The word is compounded of *ad*, to; and *causari*, to plead.

Writers on politics treat on the benefit and the inconveniences of public accusations. Various arguments are alleged, both for the encouragement and discouragement of accusations against great men. Nothing, according to Michiavel, tends more to the preservation of a state, than frequent accusations of persons trusted with the administration of public affairs. This, accordingly, was strictly observed by the Romans, in the instances of Camillus, accused of corruption by Manlius Capitolinus, *&c.* Accusations, however, in the judgment of the same author, are not more beneficial than calumnies are pernicious; which is also confirmed by the practice of the Romans. Manlius not being able to make good his charge against Camillus, was cast into prison.

By the *Roman* law, there was no public accuser for public crimes; every private person, whether interested in the crime or not, might accuse, and prosecute the accused to punishment, or absolution. Cato, the most innocent person of his age, had been accused 42 times, and as often absolved. But the accusation of *private* crimes was never received but from the mouths of those who were immediately interested in them: None (*e.g.*) but the husband could accuse his wife of adultery.

The ancient Roman lawyers distinguished between *postulatio*, *delatio*, and *accusatio*. For, first, leave was desired to bring a charge against one, which was called *postulare*: then he against whom the charge was laid, was brought before the judge: which was called *deferre*, or *nominis delatio*: lastly, the charge was drawn up and presented, which was properly the *accusatio*. The accusation properly commenced, according to Pædianus, when the *reus* or party charged, being interrogated, denied he was guilty of the crime, and subscribed his name to the *delatio* made by his opponent.

In the *French* law, none but the Procureur general, or his deputies, can form an accusation, except for high-treason and coining, where accusation is open to every body. In other crimes, private persons can only act the part of denouncers, and demand reparation for the offence, with damages.

In *Britain*, by Magna Charta, no man shall be imprisoned or condemned on any accusation, without trial by his peers, or the law; none shall be vexed with any accusation, but according to the law of the land; and no man may be molested by petition to the king, &c. unless it be by indictment or presentment of lawful men or by process at common law. Promoters of suggestions, are to find surety to pursue them; and if they do not make them good, shall pay damages to the party accused, and also a fine to the king. No person is obliged to answer upon oath to a question whereby he may accuse himself of any crime.

ACCUSATIVE; in the Latin grammar, is the fourth case of nouns, and signifies the relation of the noun on which the action implied in the verb terminates; and hence, in such languages as have cases, these nouns have a particular termination, called *accusative*: as, *Augustus vicit Antonium*, Augustus vanquished Antony. Here *Antonium* is the noun, on which the action implied in the verb *vicit* terminates; and, therefore, must have the accusative termination. Ovid, speaking of the palace of the sun, says, *Materiem superabat opus*, The work surpassed the materials. Here *materiem* has the accusative termination; because it determines the action of the verb *superabat*.—In the English language there are no cases, except the genitive; the relation of the noun being shown by the assistance of prepositions, as *of*, *to*, *from*, &c.

ACCUSIORUM Colonia (anc. geog.), an inland town in the Cavares, in Gallia Narbonensis: now *Grenoble*, in Dauphiné. See Grenoble.

ACE, among gamesters, a card or die marked only with one point.

ACELUM, or Acelium (anc. geog.), a town of the Venetian territory, now called, *Azolo*, situated to the west of Trevigi, at the source of the rivulet Musone. E. Long. 13°. N. Lat. 45°.

ACENTETUM, or Acanteta, in natural history, a name given by the ancients to the purest and finest kind of rock crystal: They used the crystal in many ways; sometimes ingraving on it, and sometimes forming it into vases and cups, which were held next in value to the *vasa murrhina* of these times. The crystal they obtained from the island of Cyprus was much esteemed; but often faulty in particular parts, having hairs, cracks, and foulnesses, which they called *salts*, in the middle of the large pieces. Pliny tells us, that when it was used for engraving on, the artist could conceal all these blemishes among the strokes of his work; but when it was to be formed into cups or precious vases, they always chose the acentetum which had no flaws or blemishes.

ACEPHALI, or Acephalitæ, a term applied to several sects who refused to follow some noted leader. Thus the persons who refused to follow either John of Antioch, or St Cyril, in a dispute that happened in the council of Ephesus, were termed *Acephali*, without a head or leader. Such bishops, also, as were exempt from the jurisdiction and discipline of their patriarch, were styled *Acephali*.

Acephali, the levellers in the reign of king Henry I. who acknowledged no head or superior. They were reckoned so poor, that they had not a tenement by which they might acknowledge a superior lord.

ACEPHALOUS, or Acephalus, in a general sense; without a head.

The term is more particularly used in speaking of certain nations, or people, represented by ancient naturalists and cosmographers, as well as by some modern travellers, as formed without heads; their eyes, mouths, &c. being placed in other parts.

Such are the Blemmyes, a nation of Africa near the head of the Niger, represented to be by Pliny and Solinus; *Blemmyes traduntur capita abesse, ore et oculis pectore affixis*. Ctesias and Solinus mention others in India near the Ganges, *sine cervice oculos in humeris habentes* Mela also speaks of people, *quibus capita et vultus in pectore sunt*. And Suidas, Stephanus Byzantinus, Vopiscus, and others after them, relate the like. Some modern travellers still pretend to find acephalous people in America.

Several opinions have been framed as to the origin of the fable of the Acephali. The first is that of Thomas Bartholin, who turns the whole into a metaphor; being convinced, that the name Acephali was anciently given to such as had less brain, or conducted themselves less by the rules of prudence, than others. Olearius rather apprehends, that the ancient voyagers, viewing certain barbarous people from the coasts, had been imposed on by their uncouth dress; for that the Samogitians, being short of stature, and going in the severity of winter with their heads covered in hoods, seem at a distance as if they were heedless. F. Lasitau says, that by Acephali are only meant, people whose heads are sunk below their shoulders. In effect, Hulsius, in his epitome of Sir Walter Raleigh's voyage to Guaiana, also speaks of a people which that traveller found in the province of Irvipanama, between the lakes of Panama and Cassipa, who had no head or neck; and Hondius, in his map, marks the place with the figures of these monsters. Yet De Laet* rejects the story; being informed by others, that the inhabitants of the banks of the Caora, a river that flows out of the lake of Cassipa, have their head so far sunk between their shoulder, that many believed they had their eyes in their shoulders and their mouths in their breasts.

* Descript. Amer. l. 17. c. 22.

But though the existence of a nation of *Acephali* be ill warranted, naturalists furnish several instances of individuals born without heads, by some lusus or aberration of nature. Wepfer gives † a catalogue of such acephalous births, from Schenckius, Licetus, Paræus, Wolfius, Mauriceau, &c.

† In Eph. Ger. dec. 1. an. 3. obs. 129. p. 184. Dec. 2. an. 9. obser. 148. p. 258.

Acephalus, an obsolete term for the tænia or tape-

Acephalus, Acer, the Maple-tree

tape-worm, which was long supposed to be acephalous. See Tænia. The first who gave it a head was Tulpius; and after him, Fehr: The former even makes it *biceps*, or two headed.

Acephalus, is also used to express a verse defective in the beginning.

ACER, the Maple or Sycamore Tree, a genus of the monœcia order, belonging to the polygamia class of plants; and ranking under the 23d Natural Order *Trihilatæ*.—The generic characters, both natural and essential, are: The Hermaphrodite *calyx* is an acute, coloured, one-leaved perianthium, divided into five segments, flat and entire at the base, and persistent: the *corolla* is five-petal'd, ovate, and expanding: the *stamina* consist of eight subulated short filaments; the antheræ simple, the dust cruciform: The *pistillum* has a compressed germen, immersed in the receptacle, which is convex, perforated, and large; the stylus is filiform: the stigmata are two, pointed, slender, and reflex: The *pericarpium* consists of two or three capsulæ uniting at the base, roundish, compressed, each terminated with a large membranous wing: The *seeds* are solitary and roundish. The Male *calyx*, *corolla*, and *stamina*, are the same as in the hermaphrodite; The *pistillum* has no germen, nor stylus; the stigma is befid. [*Nota*, On the first opening of the flower, the *stigma* alone appears; a few days after, the *stylus*.—The hermaphrodite flowers on the same umbel are frequently of two sorts: the inferior ones *feminine*, the antheræ of which do not burst, but the pistillum quickly grows into fruit: the superior ones *masculine*, of which the antheræ scatter their pollen, but the pistilla without increasing fall off.]

Species, with their uses and properties.] 1. The pseudo-platanus, or sycamore, is a very large and beautiful tree, with broad leaves, divided into five lobes serrated in their edges; of a dark green colour on the upper side, but paler and somewhat hoary underneath; the flowers are very small, and of a greenish white colour. The corolla of this species is scarcely distinguishable from the c[illegible]x, and the stamina are long. The fruit is large, and beautifully variegated with green and purple. This species is a native of Germany, but thrives very well in Great Britain, where it is frequent in plantations. It is very proper for making plantations near the sea, or sheltering such as are already too near it; because the sycamore-tree resists the spray of the ocean much better than most other trees. But it has this inconvenience, that its leaves are devoured by insects, so as to become full of holes, and very unsightly: which has caused the planting of it to be much neglected of late. It has, however, long been considered as a timber tree, having been much used by the turners for wooden bowels, dishes, trenchers, &c.; but since the custom of using earthen ware has become so prevalent, its value for those purposes has greatly decreased. There are two varieties; one with broad leaves and large keys, the other with variegated leaves. By tapping it yields a liquor not unlike that of the birch tree; from which the highlanders of Scotland some times make an agreeable and wholesome wine.

2. The campestris, or common maple, is too well known to need any particular description, as it grows very frequently in hedge-rows in most parts of Britain. The timber of the common maple is far superior to the beech for all the uses of the turner. When it abounds with knots, as it frequently does, it is highly esteemed by joiners for inlayings. It is also frequently employed for making musical instruments, on account of its lightness; and for the whiteness of its wood was formerly esteemed for making tables, &c. But the principal value of the maple is for underwood; it being of a quick growth, and affording good fuel.

Acer, the Maple-tree

3. The negundo, or Virginian ash-leaved maple, is a very strong shooting tree; and in Virginia, where it is a native, is one of the largest trees of this kind. Its leaves are of a pale green, and well adapted to give a variety of tint: but Hanbury says, that this tree ought not to be planted in exposed situations, the branches being subject to be split off by the wind. Its uses are similar to those of the sycamore.

4. The platanoides, or Norway-maple, grows naturally in Norway, Sweden, and other northern countries of Europe. It rises to a good height, and is well furnished with branches with smooth leaves, of a shining green colour, and beautifully indented. These have an acrid milky juice, which prevents them from being preyed upon by insects as the sycamore is; and as this species resists the spray of the sea equally with the first, it is preferable in plantations situated near the sea. In autumn the leaves dye to a golden yellow colour, which causes a delightful effect at that season when the different tints of decaying vegetables are displayed. The flowers are also beautiful; they come out early in the spring, are of a fine yellow colour, and show themselves to advantage before the leaves come out. They are frequently succeeded by keys, which sometimes arrive at maturity in Britain. There is a variety with striped leaves.

5. The rubrum, or Virginia scarlet flowering maple, is a native of that country, and never grows to a large size in Britain. It is, however, cultivated in gardens for the beauty of its flowers, which appear in the beginning of April, in roundish bunches, at the bottom of the footstalks of the leaves. The seeds are ripe in five or six weeks after; and ought to be immediately sown, being otherwise very apt to perish. The tree ought to be sheltered, especially whilst young, from the north-east winds; it delights in a moist light soil, where it will thrive much better, as well as produce many more flowers and much better seeds, than in a dry ground. A variety of this tree is known in England by the name of *Sir Charles Wager's Flowering Maple*, from its being first sent from America to Sir Charles Wager. The flowers of this kind come out in larger clusters than the other, and surround the small branches, so that the tree appears entirely covered with them, and makes a much more beautiful appearance than the former, which is now not so much esteemed.

6. The saccharinum, or sugar-maple, is a large growing tree: will arrive at the height of 40 feet; and has broad thin leaves, divided into five principal parts; which are again indented or cut at the edges into several acute segments. Their surface is smooth, of a light green colour, whitish underneath; and they grow on pretty long footstalks. The flowers come out in the spring, about the time of the Norway maple; and they are succeeded by long keys, which sometimes ripen in England. In America the inhabitants tap this tree in the spring, boil the liquor, and the feces afford

ford a useful sugar. The sycamore, the ash-leaved, and the Norway maples, also abound with a saccharine juice, from which there is no doubt but a useful sugar might be prepared.

7. The Pensylvanicum, or American mountain-maple, very much resembles the sugar-maple, only its leaves are more pointed.

8. The opalus, or Italian maple, is very common in most parts of Italy, particularly about Rome; but in Britain is very rarely to be met with, though hardy enough to bear the open air. It is one of the largest species of trees in Italy, and affords a great shade by its numerous and large leaves. On this account it is planted on the road-sides, and near habitations.

9. The monspesulanum, or Montpelier maple, is common in the south of France, and in Italy; but is hardly met with in Britain. The leaves resemble those of the common maple; but are of a much thicker substance, a shining green colour, and not so large. They continue in verdure very late in the autumn, which renders the trees more valuable.

10. The creticum, or Cretan maple, grows naturally in the Levant; it somewhat resembles the last species; but its leaves are of a much thicker texture, and their footstalks covered with a soft hairy down; whereas those of the other are smooth and soft.

Propagation and culture.]—1. By *seeds*. The first four species are easily propagated in this way. The keys, when ripe in autumn, may be gathered, and in a few days after sown about an inch and an half deep, in beds of common mould. In spring the plants will appear, and make a shoot of about a foot and an half by the autumn following, if the ground of the seminary be tolerably good, and they are kept free from weeds. The spring after they come up they should be planted in the nursery in rows two feet and an half asunder, and their distance in the rows must be one foot and an half. Here they may remain till they are big enough to plant out finally, with no further trouble than taking off unsightly side-branches, and such as have a tendency to make the tree forked, except digging between the rows, which must always be done every winter.——For the other species, their seeds, as they do not ripen in this country, ought to be procured from the places where they naturally grow, and managed in the following manner: A cool shady part of the seminary should be appropriated for the purpose; the mould should be made fine; beds should be marked out four feet wide, and in length proportionable to the quantity; and in these the seeds should be regularly sown, sifting over them about half an inch of the finest mould. When the plants come up, they must be kept clean from weeds, and frequently watered; and this work must be duly attended to all summer. The next spring, the strongest may be drawn out, and planted in the nursery, in rows two feet asunder, and at the distance of a foot from each other in the rows; leaving the others in the seminary to gain strength. The spring following they also must receive the same culture; and in the nursery they may remain with no other trouble than keeping the ground clean from the weeds in summer, digging between the rows in the winter, and taking off all strong and irregular side-shoots till they are planted out. Trees raised from seeds will grow faster, and arrive at greater height, than those raised from layers: but they will not produce such quantities of flowers; which makes the latter method more eligible for those who want these plants for a low shrubbery.—Seeds of the variegated kinds also, when sown, will produce variegated plants in return: which renders the propagation of these sorts very expeditious where plenty of seeds may be had. Where these are not to be obtained, the plants are propagated by budding, as afterwards directed.

2. By *layers*. All the species may be propagated by this method; though it is never practised for the common maple and the sycamore. The young shoots may be at any time laid down in the autumn, winter, or early in the spring. By the autumn following, they will have struck root, and become good plants; when the strongest may be set out in the places where they are to remain; whilst the weakest may be planted in the nursery, like the seedlings, for a year or two, to acquire strength.

3. By *cuttings*: which method, however, is chiefly practised on the ash-leaved and Norway maples, which more readily take root this way. The cuttings should be the bottom parts of the last year's shoots: They should be taken off early in October, and planted in rows in a moist shady place. The spring and summer following, they must be duly watered as often as dry weather makes it necessary, and be kept clean from weeds. By the autumn they will be fit to remove into the nursery; though if the cuttings are not planted too close, they may remain in their situation for a year or two longer, and then be set out finally, without the trouble of being previously planted in the nursery.

4. By *budding*, *grafting*, and *inarching*. These methods are only practised for the variegated sorts and the large broad-leaved kind. The latter is to be continued no otherwise than by budding it on stalks of the common sycamore; for from the seeds, tho' so large themselves, only the common sycamore is produced.

In order to propagate these varieties by budding, let some plants of the common sycamore, one year old, be taken out of the seminary, and set in the nursery in rows a yard asunder, and the plants about a foot and a half distance from each other in the rows: Let the ground be kept clean from weeds all summer, and *turned in* in the winter; and the summer following the stocks will be of a proper size to receive the buds, which should be taken from the most beautifully-striped branches. The best time for this work is the middle or latter end of August. Having then budded your stocks with the eyes or buds fronting the north, early in October take off the bass-matting, which before this time will have confined the bark and pinched the bud, but not so as to hurt it much. Then cut off the stock just above the bud, and dig the ground between the rows. The summer following, keep the ground clean from weeds; cut off all natural side-buds from the stock as they come out; and by autumn, if the land is good, the buds will have shot forth, and formed themselves into trees five or six feet high. They may be then removed into the places where they are designed to remain; or a few of them only may be drawn out, leaving the others to be trained up for larger standards. The striped Norway maple should be budded on stocks of its own kind; for on these they take best, and both kinds are not very liable to run away from their colours. Variegated plants in general must be planted in poor, hungry, gravelly, or sandy soils, to feed the disease which occasions these beautiful stripes, and cause it to be more powerful. But these trees show their stripes in greater perfection in a good soil: The plant, though in sickness, has the appearance of health; the shoots are vigorous and strong; the leaves are large, less liable to be hurt by insects; and the stripes appear more perfect, natural, and beautiful, than those on stunted trees growing on a poor soil.

ACERB, a sour rough astringency of taste, such as that of unripe fruit.

ACERNO, a town of Italy, in the citerior principality of Naples, with a bishop's see. E. Long. 15. 46. N. Lat. 40. 50.

ACERINA, in Ichthyology, a name given by Pliny, and other of the old naturalists, to the fish we at this time call the *ruffe*. See PERCA.

ACERRA, in antiquity, an altar erected, among the Romans, near the bed of a person deceased, on which his friends daily offered incense till his burial.—The real intention probably was to overcome any offensive smell that might arise from the corpse. The Chinese have still a custom like this: they erect an altar to the deceased in a room hung with mourning; and place an image of the dead person on the altar, to which every one that approaches it bows four times, and offers oblations and perfumes.

The *Acerra* also signified a little pot wherein were put the incense and perfumes to be burnt on the altars of the gods and before the dead. It appears to have been the same with what was otherwise called *thuribulum*, and *pyxis*.

We find mention of *Acerræ* in the ancient church. The Jews had also their *Acerræ*, in our version rendered *censers*; and the Romanists still retain them under the name of *incense-pots*. In Roman writers, we frequently meet with *plena acerra*, a full acerra: to understand which, it is to be observed, that people were obliged to offer incense in proportion to their estate and condition; the rich in larger quantities, the poor only a few grains; the former poured out *acerras* full on the altar, the latter took out two or three bits with their fingers.

ACERRA, a town of Italy, in the kingdom of Naples, and in the Terra di Lavoro; seated on the river Agno. E. Long. 15. 10. N. Lat. 40. 55.

ACERRÆ (anc. geog.), the ancient name of a town on the Clanius, in Campania, not far from Naples, now ACERRA.—The name also of another town, now called *la Cirola* in the territory and to the south-east of Lodi, where the rivulet Serio falls into the Adda, to the west of Cremona and north of Placentia.

ACESCENT, a word used to denote any thing which is turning sour, or which is slightly acid. It is only applied properly to the former of these two meanings. The second may be expressed by either of the two words, *accidulous* or *sub-acid*.

ACETABULUM, in antiquity, a measure used by the ancients, equal to one-eighth of our pint. It seems to have acquired its name from a vessel in which acetum or vinegar was brought to their tables, and which probably contained about this quantity.

ACETABULUM, in anatomy, a cavity in any bone for receiving the protuberant head of another, and thereby forming that species of articulation called ENARTHROSIS.

ACETABULUM, in botany, the trivial name of a species of the peziza, or cup-peziza, a genus belonging to the cryptogamia fungi of Linnæus. It has got the name of *acetabulum*, from the resemblance its leaves bear to a cup. See PEZIZA.

ACETARY. Nehemiah Grew, in his anatomy of plants, applies the term to a pulpy substance in certain fruits, *e. g.* the pear, which is inclosed in a congeries of small calculous bodies towards the base of the fruit, and is always of an acid taste.

ACETOSA, Sorrel; by Linnæus joined to the genus of Dock, under the title of *Rumex*. See RUMEX.

ACETOSELLA, in botany, a species of OXALIS.

ACETOUS, an epithet applied to such substances as are sour or partake of the nature of vinegar.

ACETUM, VINEGAR, the vegetable ACID of the chemists. See VINEGAR.

ACHABYTUS (anc. geog.), a high mountain in Rhodes, on the top of which stood a temple of Jupiter.

ACHÆA (anc. geog.), a town of the island of Rhodes, in the district of Jalysus, and the first and most ancient of all, said to be built by the Heliades, or Grandsons of the Sun.

ACHÆA, a hamlet of Asiatic Sarmatia on the Euxine. The inhabitants were called *Achæi*, a colony of the Orchomenians.

ACHÆANS, the inhabitants of ACHAIA Propria, a Peloponnesian state. This republic was not considerable in early times, for the number of its troops, nor for its wealth, nor for the extent of its territories; but it was famed for its probity, its justice, and its love of liberty. Its high reputation for these virtues was very ancient. The Crotonians and Sybarites, to re-establish order in their towns, adopted the laws and customs of the Achæans. After the famous battle of Leuctra, a difference arose betwixt the Lacedemonians and Thebans, who held the virtue of this people in such veneration, that they terminated the dispute by their decision. The government of the Achæans was democratical. They preserved their liberty till the time of Philip and Alexander: But in the reign of those princes, and afterwards, they were either subject to the Macedonians, who had made themselves masters of Greece, or oppressed by cruel tyrants. The Achæan commonwealth consisted of twelve inconsiderable towns in Peloponnesus. Its first annals are not marked by any great action, for they are not graced with one eminent character. After the death of Alexander, this little republic was a prey to all the evils which flow from political discord. A zeal for the good of the community was now extinguished: Each town was only attentive to its private interest. There was no longer any stability in the state; for it changed its masters with every revolution in Macedonia. Towards the 124th Olympiad, about the time when Ptolemy Soter died, and when Pyrrhus invaded Italy, the republic of the Achæans recovered its old institutions and unanimity. The inhabitants of Patæ and Dymæ were the first asserters of ancient liberty. The tyrants were banished, and the towns again made one commonwealth. A public council was then held, in which affairs of importance were discussed and determined. A register was appointed to record the transactions of the council. This assembly had two presidents, who were nominated alternately by the different towns. But instead of two presidents, they soon elected but one. Many neighbouring towns which admired the constitution of this republic, founded on equality, liberty, the love of justice, and of the public good, were incorporated with the Achæans, and admitted to the full enjoyment of their laws and privileges.—The arms which the Achæans chiefly used were slings. They were trained to the art from their infancy, by slinging from a great distance, at a circular mark of a moderate circumference. By long practice they took so nice an aim, that they were sure, not only to hit their enemies on the head, but on any part of the face they chose. Their slings were of a different kind from those of the Balearians, whom they far surpassed in dexterity.

ACHÆI, (Achæans); the inhabitants of Achaia Propria. In Livy, the people of Greece; for the most part called *Achivi*, by the Roman poets. In Homer, the general name for Grecians. See ACHÆANS.

ACHÆORUM PORTUS, (Pliny); now *Porto Buon*, a harbour of the Chersonesus Taurica, on the Euxine. Another, near Sigæum, into which the Xanthus, after being joined by the Simois, falls.

ACHÆMENES, according to Herodotus, was father of Cambyses, and grandfather of Cyrus the first, king of Persia. Most of the commentators of Horace are of opinion, that the Achæmenes whom that poet mentions, ode xii. of his 2d book, was one of the Persian monarchs: but, if that were true, he must have reigned before the Medes subdued the Persians; for we do not hear of any king of that name from the time that the Persians founded that great monarchy, which is looked upon as the second universal one. However this be, the epithet *Archæmenians* is frequently given to the Persians, in the old Latin poets.

ACHÆMENES, son of Darius I. king of Persia, and brother of Xerxes, had the government of Egypt bestowed on him, after Xerxes had forced the Egyptians to return to their allegiance. He sometime after commanded the Egyptian fleet in the celebrated expedition which proved so fatal to all Greece. The Egyptians having again taken up arms after the death of Xerxes, Achæmenes was sent into Egypt to suppress the rebellion; but was vanquished by Inarus, chief of the rebels, succoured by the Athenians.

ACHÆUS, cousin-german to Seleucus Ceraunus and Antiochus the Great, kings of Syria, became a very powerful monarch, and enjoyed the dominions he had usurped for many years; but at last he was punished for his usurpations in a dreadful manner, in the 140th year of Rome, as related by Polybius*.

* Lib. viii. cap. v. 6.

ACHAIA, a name taken for that part of Greece which Ptolemy calls *Hellas*; the younger Pliny, *Græcia*; now called *Livadia*: bounded on the north by Thessaly, the river Sperchius, the Sinus Maliacus, and mount Oeta; on the west by the river Achelous; on the east, turning a little to the north, it is washed by the Archipelago, down to the promontory of Sunium; the south, joined to the Peloponnesus, or Morea, by the isthmus of Corinth, five miles broad.

ACHAIA Propria, anciently a small district in the north of Peloponnesus, running westward along the bay of Corinth, and bounded on the west by the Ionian Sea, on the south by Elis and Arcadia, and on the east by Sicyonia: inhabitants, the *Achæans*, properly so called; its metropolis, *Patræ*. It is now called *Romania Alta*, in the Morea.

Achaia was also taken for all those countries that joined in the Achæan league, reduced by the Romans to a province. Likewise for Peloponnesus.

ACHAIÆ *Presbyteri*, or the Presbyters of Achaia, were those who were present at the martyrdom of St Andrew the Apostle, A. D. 59; and are said to have written an epistle in relation to it. Bellarmin, and several other eminent writers in the church of Rome, allow it to be genuine; while Du Pin, and some others, expressly reject it.

ACHAIUS, son of Ethwin, was raised to the crown of Scotland, A. D. 788. The emperor Charlemagne sent an embassy to desire an alliance with him against the English, whose parties so infested the seas, that the merchants could not carry on their trade. This alliance was concluded in France upon conditions so advantageous to the Scots, that Achaius, to perpetuate the memory of it, added to the arms of Scotland a double field sowed with lilies. He died in 819.

ACHALALACTLI, in ornithology, a species of king's-fisher. See ALCEDO.

ACHAN, the son of Carmi, of the tribe of Judah, at the taking of Jericho concealed two hundred shekels of silver, a Babylonish garment, and a wedge of gold, contrary to the express command of God. This sin proved fatal to the Israelites, who were repulsed at the siege of Ai. In this dreadful exigence, Joshua prostrated himself before the Lord, and begged that he would have mercy upon his people. Achan was discovered by casting lots, and he and his children were stoned to death. This expiation being made, Ai was taken by stratagem. Josh. vii. 8. 9.

ACHANE, an ancient Persian corn measure, containing 45 Attic medimni.

ACHARACA, anciently a town of Lydia, situate between Trulles and Nysa; in which were the temple of Pluto, and the cave Charonium, where patients slept in order to obtain a cure.

ACHAT, in law, implies a purchase or bargain. And hence probably purveyors were called *Achators*, from their making bargains.

ACHATES, the companion of Eneas, and his most faithful friend, celebrated in Virgil.

ACHATES, in natural history. See AGATE.

ACHATES (anc. geog.), a river of Sicily, now the *Drillo*; which runs from north to south, almost parallel with, and at no great distance from, the Gela; and rises in the north of the territory of Notto. It gave name to the Achates, or Agate, said to be first found there.

ACHAZIB, or ACHZIB, (anc. geog.), a town of Galilee, in the tribe of Asher, nine miles from Ptolemais.—Also a town in the more southern parts of the tribe of Judah.

ACHEEN, ACHE', or ACHEN, a kingdom of Sumatra in the East-Indies, situated on the north-west-ern part of the island.

The capital is situated on a river which empties itself near the north-west point, or Acheen-head, about two miles from the mouth. It lies in a wide valley, formed like an amphitheatre by two lofty ranges of hills. The river is not large, and by emptying itself in several channels is rendered very shallow at the bar. In the dry monsoon it will not admit boats of any burthen, much less large vessels, which lie without, in the road formed by the islands off the point. Though no longer the great mart of eastern commodities, it still carries on a considerable trade with the natives of that part of the coast of Indostan called *Telinga*, who supply it with the cotton goods of their country, and receive in return, gold-dust, sapan-wood, betel-nut, patch-leaf (*colsus Indicus*), a little pepper, sulphur, camphire, and benzoin. The country is supplied with Bengal opium, and also with iron, and many other articles of merchandize, by the European traders.

Acheen is esteemed, comparatively, healthy, being more free from woods and swamps than most other portions of the island; and the fevers and dysenteries to which these are supposed to give occasion, are there said to be uncommon. The soil is light and fertile; and the products, besides those already enumerated as articles of export trade, and a variety of fine fruits, are chiefly rice and cotton. There is likewise some raw silk procured in the country, of very inferior quality. Gold dust is collected in the mountains near Acheen, but the greatest part is brought from the southern ports of Nalaboo and Soosoo. The sulphur is gathered from a volcano mountain in the neighbourhood, which supplies their own consumption for the manufacture of gun-powder, and admits of a large exportation.

In their persons, the Achenese differ from the rest of the Sumatrans, being taller, stouter, and darker complexioned. They appear not to be a genuine people; but are thought, with great appearance of reason, to be a mixture of Battas, Malays, and Moors from the west of India. In their dispositions they are more active and industrious than their neighbours; they possess more penetration and sagacity; have more general knowledge; and as merchants, they deal upon a more extensive and liberal footing. Their religion is Mahometanism; and, having a great number of mosques and priests, its forms and ceremonies are strictly observed.

The appearance of the town, and the nature of the buildings, are much the same as are found in the generality of Malay bazars, excepting that the superior wealth of this place has occasioned a great number of public edifices, but without the smallest pretensions to magnificence. The king's palace, if it deserves the appellation, is a very rude and uncouth piece of architecture, designed to resist the force of an enemy, and surrounded for that purpose by strong walls, but without any regular plan, or view to the modern system of military attack. The houses in common are built of bamboos and rough timber, and raised some feet from the ground on account of the place being overflowed in the rainy season.

A considerable fabrick of a thick species of cotton cloth, and of stuff for the short drawers worn both by Malays and Achenese, is established here, and supplies an extensive demand. They weave also very handsome silk pieces, of a particular form, for that part of the dress which is called by the Malays *cayen sarrong*.

The Achenese are expert and bold navigators, and employ a variety of vessels, according to the voyages they undertake, and the purposes for which they design them. The river is covered with a multitude of fishing sampans or canoes, which go to sea with the morning breeze, and return in the afternoon, with the sea wind, full laden.

Having no convenient coins, though most species of money will be taken there at a valuation, they commonly make their payments in gold dust, and for that purpose are all provided with scales or small steelyards. They carry their gold about them wrapped up in pieces of bladder, and often purchase to so small an amount, as to make use of grain or seeds for weights.

The monarchy is hereditary; and the king usually maintains a guard of 100 Seapoys about his palace.

According to Mr Marsden, "the grand council of the nation consists of, the King or *Sultan*, four *Ooloobballangs*, and eight of a lower degree, who sit on his right hand, and sixteen *Cajoorangs*, who sit on his left. At the king's feet sits a woman, to whom he makes known his pleasure: by her it is communicated to an eunuch, who sits next to her, and by him to an officer named *Cajoorang Gondong*, who then proclaims it aloud to the assembly. There are also present two other officers, one of whom has the government of the *bazar* or market, and the other the superintending and carrying into execution the punishment of criminals. All matters relative to commerce and the customs of the port come under the jurisdiction of the *Shabandar*, who performs the ceremony of giving the *chap* or licence for trade; which is done by lifting a golden handed creese over the head of the merchant who arrives, and without which he dares not to land his goods. Presents, the value of which are become pretty regularly ascertained, are then sent to the king and his officers. If the stranger be in the style of an ambassador, the royal elephants are sent down to carry him and his letters to the monarch's presence; these being first delivered into the hands of an eunuch, who places them in a silver dish, covered with rich silk, on the back of the largest elephant, which is provided with a machine (*houder*) for that purpose. Within about an hundred yards of an open hall where the king sits, the cavalcade stops, and the ambassador dismounts, and makes his obeisance by bending his body, and lifting his joined hands to his head. When he enters the palace, if an European, he is obliged to take off his shoes; and having made a second obeisance, is seated upon a carpet on the floor, where *betel* is brought to him. The throne was some years ago of ivory and tortoiseshell, and when the place was governed by queens, a curtain of gauze was hung before it, which did not obstruct the audience, but prevented any perfect view. The stranger, after some general discourse, is then conducted to a separate building where he is entertained with the delicacies of the country, by the officers of state, and in the evening returns in the manner he came, surrounded by a prodigious number of lights. On high days (*aree ryah*) the king goes in great state mounted on an elephant richly caparisoned, to the great mosque, preceded by his *ooloobballangs*; who are armed nearly in the European manner."

The country under the immediate jurisdiction of Acheen, is divided into three districts, named *Duo* *pooloo*

pooloo duo, Duo pooloo leemo, and *Duo pooloo anam.* Each district is governed by a Pangleemo, and under him an Imaum and four Pangeeches to each mosque.

"Achen has ever been remarkable for the severity with which crimes are punished by their laws; the same rigour still subsists, and there is no commutation admitted, as is regularly established in the southern countries. There is great reason, however, to conclude that the poor alone experience the rod of justice; the nobles being secure from retribution in the number of their dependents. Petty theft is punished by suspending the criminal from a tree, with a gun or heavy weight tied to his feet; or by cutting off a finger, a hand, or leg, according to the nature of the theft. Many of these mutilated and wretched objects are daily to be seen in the streets. Robbery on the highway and house-breaking are punished by drowning, and afterwards exposing the body on a stake for a few days. If the robbery is committed upon an imaum or priest, the sacrilege is expiated by burning the criminal alive. A man who is convicted of adultery is seldom attempted to be screened by his friends, but is delivered up to the friends and relations of the injured husband. These take him to some large plain, and forming themselves in a circle, place him in the middle. A large weapon called a *Gadoobong*, is then delivered to him by one of his family; and if he can force his way through those who surround him, and make his escape, he is not liable to further prosecution; but it commonly happens that he is instantly cut to pieces. In this case his relations bury him as they would do a buffalo, refusing to admit the corpse into their house, or to perform any funeral rites." These discouragements to vice might seem to bespeak a moral and virtuous people: yet all travellers agree in representing the Achenese as one of the most dishonest and flagitious nations of the East.

Achen was visited by the Portuguese in 1509, only 12 years after they had discovered the passage to the East-Indies by the Cape of Good Hope. They made various attempts to establish themselves in the country, but were expelled with disgrace. See SUMMATRA.

ACHELOUS, in fabulous history, wrestled with Hercules, for no less a prize than Deianira, daughter to king Oenus: but as Achelous had the power of assuming all shapes, the contest was long dubious: at last, as he took that of a bull, Hercules tore off one of his horns; so that he was forced to submit, and to redeem it by giving the conqueror the horn of Amalthea, the same with the Cornucopia or horn of plenty; which Hercules having filled with a variety of fruits, consecrated to Jupiter. Some explain this fable, by saying, That Achelous is a winding river of Greece, whose stream was so rapid, that it roared like a bull, and overflowed its banks; but Hercules, by bringing it into two channels, broke off one of the horns, and so restored plenty to the country. *See the next article.*

ACHELOUS, a river of Acarnania; which rises in mount Pindus, and, dividing Ætolia from Acarnania, falls from north to south into the Sinus Corinthiacus. It was formerly called *Thoas*, from its impetuosity, and *king of rivers*, (Homer.) The epithet *Achelous* is used for *Aqueus*, (Virgil); the ancients calling all water *Achelous*, especially in oaths, vows, and sacrifices, according to Ephorus: Now called *Aspro Potamo.* Rivers are by the ancient poets called *Tauriformes*, either from the bellowing of their waters, or from their ploughing the earth in their course: Hercules, restraining by dykes and mounds the inundations of the *Achelous*, is said to have broken off one of his horns, and to have brought back plenty to the country. *See the preceding article.*

ACHERI (LUKE D'), a learned Benedictine of the congregation of St Maur, was born at St Quintin, in Picardy, in 1609; and made himself famous by printing several works, which till then were only in manuscript: particularly, The epistle attributed to St Barnabas; The works of Lanfrank, archbishop of Canterbury; A collection of scarce and curious pieces, under the title of Spicilegium, *i. e.* Gleanings, in thirteen volumes, quarto. The prefaces and notes, which he annexed to many of these pieces, show him to have been a man of genius and abilities. He had also some share in the pieces inserted in the first volumes of The acts of the saints of the order of St Bennet; the title whereof acquaints us that they were collected and published by him and father Mabillon. After a very retired life, till the age of 73, he died at Paris the 29th of April, 1685, in the abbey of St Germain in the fields, where he had been librarian.

ACHERNER, or ACHARNER, a star of the first magnitude in the southern extremity of the constellation ERIDANUS.

ACHERON, a river of Epirus. The poets feigned it to have been the son of Ceres, whom she hid in hell for fear of the Titans, and turned into a river, over which souls departed were ferried in their way to Elysium.

ACHERON, a river of Thesprotia, in Epirus; which, after forming the lake Acherusia, at no great distance from, it falls into the sea near the promontory of Chimerium, to the west of the Sinus Ambracius, in a course from north to south.

ACHERON, or ACHEROS, a river of the Bruttii in Italy, running from east to west: Where Alexander king of Epirus was slain by the Lucani, being deceived by the oracle of Dodona, which bid him beware of Acheron.

ACHERSET, an ancient measure of corn, conjectured to be the same as our quarter, or eight bushels.

ACHERUSIA PELUS, a lake between Cumæ and the promontory Misenum, now *il Lago Della Collucia*, (Cluverius.) Some confound it with the *Lacus Lucrinus*, and others with the *Lacus Averni.* But Strabo and Pliny distinguish them. The former takes it to be an effusion, exundation, or washes of the sea, and therefore called by Lycophron, Αχηρουσια χυσις.—Also a lake of Epirus, through which the Acheron runs.—There is also an *Acherusia*, a peninsula of Bithynia on the Euxine, near Heraclea; and a cave there of the same name, through which Hercules is fabled to have descended to hell to drag forth Cerberus.

ACHIAR, is a Malayan word, which signifies all sorts of fruits and roots pickled with vinegar and spice. The Dutch import from Batavia all sorts of achiar, but particularly that of BAMBOO (see ARUNDO), a kind of cane, extremely thick, which grows in the East Indies. It is preserved there, whilst it is still green, with a very strong vinegar and spice; and is called *bamboo-achiar*. The name changes according to the fruit with which the achiar is made.

ACHICOLUM, is used to express the *fornix, tholus,*

 lus, or *ſudatorium* of the ancient baths; which was a hot room where they uſed to ſweat. It is alſo called *architholus*.

ACHILLÆA, Yarrow, Milfoil, Nosebleed, or Sneezewort; a genus of the order of the polygamia ſuperflua, belonging to the ſyngeneſia claſs of plants. The natural order to which it belongs is the 49th, *Compoſitæ diſcoides*.

The characters are: The common *calyx* is ovate and imbricated, with ovate, acute, converging ſcales. The *compound corolla* is rayed; the hermaphrodite corollets are tubular in the diſc, the feminine linguiform and from 5 to 10 in the rays: The *proper corolla* of the hermaphrodites is funnel-ſhaped, expanded, and divided into 5 ſegments; that of the females, tongue-ſhaped, inverſely cordated, expanding, and of 3 ſegments. The *ſtamina* in the hermaphrodites conſiſt of 5 very ſhort capillary filaments; the anthera is cylindric and tubular. The *piſtillum* in the hermaphrodites has a ſmall germen; the ſtylus is filiform the length of the ſtamina; the ſtigma is obtuſe and endnotched: in the females, the germen is ſmall; the ſtylus is filiform; the ſtigmata are 2, obtuſe and reflected. The *pericarpium* is wanting; the calyx ſcarcely changed; the receptacle filiform, elongated at the diſc of the ſeeds, ovate, and twice as long as the calyx. The *ſeeds* are ſolitary, ovate, and furniſhed with a lock of wool; no pappus. The *receptaculum* is chaffy and elevated.

Species and properties. There are 20 ſpecies, of which the following are the principal: 1. The millifolium, or common yarrow, is found naturally on banks, and by the ſides of foot-paths, in moſt parts of England. It moſt commonly bears white flowers, though a variety of it is found which bears purple ones. Theſe, however, do not long continue to bear flowers of this colour, if tranſplanted into gardens. It was formerly uſed in medicine; but though it may ſtill have a place in ſome diſpenſatories, no phyſician of any note expects any virtue from it, or ever preſcribes it. It creeps greatly by its roots, and alſo multiplies by the ſeeds, ſo that it becomes a troubleſome weed where it is once allowed to get a footing. The cultivation of it is recommended by Mr Anderſon, in his Eſſays on Agriculture, as a proper food for cattle. This ſpecies was the proper achillæa of the ancients, ſo named from Achilles; who, having been the diſciple of Chiron, firſt brought it into uſe for the cure of wounds and ulcers. 2. The ſantolina, or eaſtern ſneezewort, is ſometimes cultivated in gardens; it has large yellow flowers, which ſtand upon pretty long footſtalks placed ſingly, not in bunches as in the common kind. It has leaves like lavender-cotton, which, when rubbed, emit a ſtrong oily odour. The flowers appear in June and July. 3. The tomentoſa, or woolly yarrow, is a native of the ſouth of France and Spain, but lives in the open air in England. The flowers are of a bright yellow, and continue long in beauty, growing in cluſters at the top of the ſtalks, which ſeldom riſe above a foot high. The leaves are finely cut, and very hoary. 4. The abrotanifolia, or tall eaſtern yarrow, is a native of the iſlands in the Archipelago: it grows to the height of two feet and a half, with large umbels of yellow flowers on the top; the leaves reſemble thoſe of the common wormwood, and are cut into long narrow ſegments. 5. The clavenna, or Alpine umbelliferous wormwood, takes its name from the mountains of which it is a native. It ſeldom grows above ſix or ſeven inches in height; it ſupports umbels of white flowers, like thoſe of the common ſneezewort, which appear in April and May. The leaves are ſilvery, and ſhaped like thoſe of wormwood, which often decay in the autumn and winter. 6. The tanacetifolia, or eaſtern ſneezewort, with tanſey leaves, is a very humble plant, ſeldom riſing above ſix inches in height. The flowers are nearly as large as thoſe of the common ſneezewort, white, and growing in flat umbels. They appear in June and July. The leaves of the plant have ſome likeneſs to thoſe of the common wormwood, are very hoary, grow cloſe to the ground, and decay in autumn ſo as to make little appearance in winter. Like the laſt ſpecies, this is a native of the Alps. 7. The ageratum, or ſweet maudlin, was formerly much uſed in medicine and for culinary purpoſes, but has now fallen ſo much into neglect as to be totally unknown in the markets; ſo that when it is demanded, the white maudlin is ſubſtituted in its ſtead. The reaſon of this ſubſtitution was, that the latter is more hardy and eaſily propagated than the ſweet maudlin, which is apt to rot in wet winters. The common maudlin flowers in June and July, and the ſeeds are ripe in September. 8. The Egyptiaca, or hoary ſneezewort, is a native of the Archipelago. It hath very hoary leaves, which remain all the year; and the plants growing cloſe and low, make a pretty appearance at all ſeaſons. The flowers are yellow, and are produced in umbels on the top of the ſtalks; they appear in June, and continue till the end of September. 9. The ptarmica, or common ſneezewort, grows wild in the woods, and other ſhady places, in many parts of England; ſo is not admitted into gardens. There is a variety, however, with double flowers, which is preſerved in gardens, and is commonly known by the name of *double maudlin*. This ſpecies creeps greatly by the roots, ſo as ſoon to overſpread a large ſpot of ground. If planted in pots, ſo as to confine its roots from creeping, the ſtalks grow cloſe together, and make a tolerable appearance when in flower; but when at a diſtance, ſo that the roots have full liberty to run, the flowers appear but indifferently. 10. The macrophylla, or Alpine ſneezewort, with fewer leaves, is a native of the Alps. It produces many ſtalks riſing near three feet high; having looſe branching umbels of white flowers on their top, reſembling thoſe of the common ſneezewort, but larger. 11. The nana, or hoary Alpine milfoil, is likewiſe a native of the Alps; the leaves are hoary, and the umbels of its flowers are more compact than the former; the ſtalks do not riſe more than a foot high. 12. The nobilis, or ſweet milfoil, approaches to the nature of the common milfoil; but its leaves are of a paler green, and are neither ſo long nor ſo much cut off as thoſe of the common milfoil are: they have a ſtrong ſweet ſcent when bruiſed. 13. The alpina, or white maudlin, bears ſome reſemblance to the common ſneezewort; but the leaves are longer, of a deeper green colour, and deeply indented in their edges; the flowers are white, and the roots creep far under ground. The plant will riſe, in good land, to the height of four feet.

Culture. All the ſorts of yarrow are eaſily propagated by ſeeds, which may be ſown either in the ſpring or or autumn upon a bed of common earth. When the plants come up, and are strong enough for transplanting, they should be planted in beds in the nursery, where they may continue till autumn, when they should be transplanted to the places where they are to remain. The Archipelago kinds, however, are often destroyed by severe frost; so they ought to be sheltered during the winter. These kinds also rarely bring their seeds to perfection in England; they are therefore to be propagated by slips, which may be taken off and planted in a shady border any time in summer, when they will take root in about six weeks, and then may be transplanted where they are to remain.

ACHILLEID, Achilleis, a celebrated poem of Statius, in which that author proposed to deliver the whole life and exploits of Achilles; but being prevented by death, he has only treated of the infancy and education of this hero. See Statius.

ACHILLES, one of the greatest heroes of ancient Greece, was the son of Peleus and Thetis. He was a native of Pythia, in Thessaly. His mother, it is said, in order to consume every mortal part of his body, used to lay him every night under live coals, anointing him with ambrosia, which preserved every part from burning but one of his lips, owing to his having licked it. She dipped him also in the waters of the river Styx; by which his whole body became invulnerable, except that part of his heel by which she held him. But this opinion is not universal, nor is it a part of his character as drawn by Homer; for in the Iliad (B. xxi. 161.) he was actually wounded in the right arm, by the lance of Asteropaus, in the battle near the river Scamander. Thetis afterwards entrusted him to the care of the centaur Chiron, who, to give him the strength necessary for martial toil, fed him with honey and the marrow of lions and wild boars. To prevent his going to the siege of Troy, she disguised him in female apparel, and hid him among the maidens at the court of king Lycomedes: but Ulysses discovering him, persuaded him to follow the Greeks. Achilles distinguished himself by a number of heroic actions at the siege. Being disgusted, however, with Agamemnon for the loss of Briseis, he retired from the camp. But returning to avenge the death of his friend Patroclus, he slew Hector, fastened his corps to his chariot, and dragged it round the walls of Troy. At last Paris, the brother of Hector, wounded him in the heel with an arrow, while he was in the temple treating about his marriage with Philoxena, daughter to king Priam. Of this wound he died, and was interred on the promontory of Sigæum; and after Troy was taken, the Greeks sacrificed Philoxena on his tomb, in obedience to his desire, that he might enjoy her company in the Elysian fields. It is said that Alexander, seeing his tomb, honoured it by placing a crown upon it; at the same time crying out, that "Achilles was happy in having, during his life, such a friend as Patroclus; and, after his death, a poet like Homer." Achilles is supposed to have died 1183 years before the Christian æra.

Achilles Tatius. See Tatius.

Tendo Achillis, in anatomy, is a strong tendinous cord formed by the tendons of several muscles, and inserted into the os calcis. It has its name from the fatal wound Achilles is said to have received in that part from Paris the son of Priam.

ACHILLINI (Alexander), born at Bologna, and doctor of philosophy in that university. He flourished in the 15th and 16th centuries, and by way of eminence was styled the Great Philosopher. He was a stedfast follower and accurate interpreter of Averroes upon Aristotle, but most admired for his acuteness and strength of arguing in public and private disputations. He made a surprising quick progress in his studies, and was very early promoted to a professorship in the university; in which he acquitted himself with so much applause that his name became famous throughout all Italy. He continued at Bologna till the year 1506; when the university of Padua made choice of him to succeed Antonio Francatiano in the first chair of philosophy, and his fame brought vast numbers of students to his lectures at Padua: but the war, wherein the republic of Venice was engaged against the league of Cambray, putting a stop to the lectures of that university, he withdrew to his native country; where he was received with the same marks of honour and distinction as before, and again appointed professor of philosophy in Bologna. He spent the remainder of his life in this city, where he died, and was interred with great pomp in the church of St Martin the Great, which belongs to the Carmelite Friars. Jovius, who knew Achillini, and heard his lectures, says, that he was a man of such exceeding simplicity, and so unacquainted with address and flattery, that he was a laughing-stock to the pert and saucy young scholars, although esteemed on account of his learning. He wrote several pieces on philosophical subjects, which he published, and dedicated to John Bentivogli.

Achillini (Claudius), grandson of the former, read lectures at Bologna, Ferrara, and Parma; where he was reputed a great philosopher, a learned divine, an excellent lawyer, an eloquent orator, a good mathematician, and an elegant poet. He accompanied Cardinal Ludovino, who went as legate into Piedmont; but being afterward neglected by this cardinal, when he became pope under the name of Gregory XV. he left Rome in disgust, and retired to Parma; where the duke appointed him professor of law, with a good salary. He published a volume of Latin Letters, and another of Italian poems, which gained him great reputation: he died in 1640, aged 66.

ACHIOTTE, or Achioti, a foreign drug, used in dying, and in the preparation of chocolate. It is the same with the substance more usually known by the name Arnotto; which see.

ACHIROPOETOS, a name given by ancient writers to certain miraculous pictures of Christ and the Virgin, supposed to have been made without hands.—The most celebrated of these is a picture of Christ, preserved in the church of St John Lateran at Rome; said to have been begun by St. Luke, but finished by the ministry of angels.

ACHMET, son of Seerim, has left a book concerning the interpretation of dreams according to the doctrine of the Indians, Persians and Egyptians, which was translated out of the Greek into Latin by Leo Tuscus in 1160. He lived in the 9th century.

ACHMET-GEDUC, a famous general under Mahomet II. and Bajazet II. in the 15th century. When Mahomet II. died, Bajazet and Zezan both claimed the throne: Achmet sided with the former, and by his bravery and conduct fixed the crown on his head. But Bajazet took away his life; shining virtue being always an unpardonable crime in the eyes of a tyrant.

ACHMETSCHET, a town of the peninsula of the Crimea, the residence of the sultan Galga, who is eldest son of the Khan of Tartary. Long. 51. 20. Lat. 45. 0.

ACHMIM, a large town of Upper Egypt, situated on the eastern bank of the Nile. "One admires there (says Abulfeda, as quoted by Mr Savary), a temple, which is comparable to the most celebrated monuments of antiquity. It is constructed with stones of a surprising size, on which are sculptured innumerable figures." Though this town be fallen from its ancient splendor, it is still one of the most beautiful of Upper Egypt. According to Mr Savary, an Arab prince commands there, and the police is well attended to. The streets are wide and clean, and commerce and agriculture flourish. It has a manufactory of cotton, stuffs, and pottery, which are conveyed over all Egypt. It is the same that Herodotus calls *Chemmis*, and Strabo *Panopolis*, or the city of Pan, who was worshipped there. Herodotus says, that Perseus was a native of this city, and that his descendants had established festivals there in his honour. It has lost its ancient edifices, and much of its extent; the ruins of the temple, described by Abulfeda, being without its limits, to the north. Nothing remains of it but some stones, of such magnitude that the Turks have not been able to move them. They are covered with hieroglyphics. On one of them are traced four concentric circles, in a square. The innermost of these contains a sun. The two succeeding ones, divided into 12 parts, contain, one, 12 birds, the other, 12 animals almost effaced, which appear to be the signs of the zodiac. The fourth has no divisions, and presents 12 human figures; which Mr Savary imagines to represent the 12 gods, the 12 months of the year, and the 12 signs of the zodiac. The Egyptians, says Herodotus, are the first who divided the year into 12 months, and employed the names of the 12 gods. The four seasons occupy the angles of the square, on the side of which may be distinguished a globe with wings. Mr Savary thinks it probable that this stone belonged to a temple dedicated to the sun, that the whole of these hieroglyphics mark his passage into the signs of the zodiac, and his course, whose revolution forms the year. The columns of this temple have been partly broken to make lime and millstones. Some of them have been transported into one of the mosques of Achmim, where they are placed without taste; others are heaped up in the squares of the town.

Mr Savary tells us of a serpent which is worshipped here, and is the wonder of the country. "Upwards of a century ago (says he), a religious Turk called *Scheilk Haridi* died here. He passed for a saint among the Mahometans; who raised a monument to him, covered with a cupola, at the foot of the mountain. The people flocked from all parts to offer up their prayers to him. One of their priests, profiting by their credulity, persuaded them that God had made the soul of Scheilk Haridi pass into the body of a serpent. Many of these are found in the Thebais, which are harmless; and he had taught one to obey his voice. He appeared with his serpent, dazzled the vulgar by his surprising tricks, and pretended to cure all disorders. Some lucky instances of success, due to nature alone, and sometimes to the imagination of the patients, gave him great celebrity. He soon confined his serpent Haridi to the tomb, producing him only to oblige princes and persons capable of giving him a handsome recompence. The successors of this priest, brought up in the same principles, found no difficulty in giving sanction to so advantageous an error. They added to the general persuasion of his virtue that of his immortality. They had the boldness even to make a public proof of it. The serpent was cut in pieces in presence of the Emir, and placed for two hours under a vase. At the instant of lifting up the vase, the priests, no doubt, had the address to substitute one exactly resembling it. A miracle was proclaimed, and the immortal Haridi acquired a fresh degree of consideration. This knavery procures them great advantages. The people flock from all quarters to pray at this tomb; and if the serpent crawls out from under the stone, and approaches the suppliant, it is a sign that his malady will be cured. It may be imagined, that he does not appear till an offering has been made proportioned to the quality and riches of the different persons. In extraordinary cases, where the sick person cannot be cured without the presence of the serpent, a *pure virgin* must come to solicit him. To avoid inconveniences on this head, they take care to choose a *a very young girl indeed*. She is decked out in her best clothes, and crowned with flowers. She puts herself in a praying attitude; and as the priests are inclined, the serpent comes out, makes circles round the young suppliant, and goes and reposes on her. The virgin, accompanied by a vast multitude, carries him in triumph amidst the general acclamation. No human reasoning would persuade these ignorant and credulous Egyptians that they are the dupes of a few impostors: they believe in the serpent Haridi as firmly as in the prophet."

ACHONRY, a small town of Ireland, in the province of Connaught and county of Sligo, seated on the river Shannon.

ACHOR, a valley of Jericho, lying along the river Jordan, not far from Gilgal; so called from Achan, the troubler of Israel, being there stoned to death.

ACHOR, in medicine, a species of HERPES.

ACHOR, in mythology, the god of flies; to whom, according to Pliny, the inhabitants of Cyrene sacrificed, in order to obtain deliverance from the insects and the disorders occasioned by them.

ACHRADINA (anc. geog.), one of the four cities or divisions of Syracuse, and the strongest, largest, and most beautiful part of it; separated by a very strong wall from the outer town, *Tycha* and *Neapolis*. It was adorned with a very large forum, with beautiful porticos, a most elegant prytaneum, a spacious senate-house, and a superb temple of Jupiter Olympius.

ACHRAS, or SAPOTA PLUM: a genus of the monogynia order, belonging to the hexandria class of plants; and ranking in the 43d Natural Order, *Dumosæ*.

The characters are: The *calyx* is a perianthium, consisting of six ovate concave erect leaflets, the exterior ones broader and shorter, the interior ones coloured. The *corolla* is composed of one ovate petal, the height of the calyx; the border divided into six segments,

ſegments. The *ſtamina* have ſix ſhort ſubulated filaments at the throat of the corolla; and the antheræ are acute. The *piſtillum* has a roundiſh depreſſed germen; the ſtylus is ſubulated, and longer than the corolla; the ſtigma is obtuſe. The *pericarpium* is a globular twelve-celled pomum, with very ſoft fleſh. The ſeeds are ſolitary, ovate, and gloſſy.

There are four ſpecies, all natives of the Weſt Indies. The principal are, 1. The ſapota, with oblong oval leaves, and ſmooth turbinated fruit. 2. The mammoſa, with ſpear-ſhaped leaves, and large oval fruit. The firſt is common about Panama, and ſome places in the Spaniſh Weſt Indies; but is not to be found in any of the Britiſh ſettlements in America. The ſecond ſort is very common in Jamaica, Barbadoes, and moſt of the Weſt India Iſlands, where the trees are planted in the gardens for their fruit, which is by many perſons greatly eſteemed. They grow to the height of 35 or 40 feet, having a ſtraight trunk covered with an aſh-coloured bark. The branches are produced on every ſide, forming a regular head; and are beſet with leaves near a foot long, and almoſt three inches broad in the middle. The flowers are of a cream colour: and are ſucceeded by large oval fruit covered by a browniſh ſkin, incloſing a thick pulp of a ruſſet colour, very luſcious, and called *natural marmalade*, from its reſemblance to that of quinces. The ſtones taken in emulſion are reckoned good againſt the gravel.—Theſe trees being natives of very hot climates, cannot be preſerved in Britain, except in the warmeſt ſtoves.

ACHROMATIC, an epithet expreſſing want of colour. The word is Greek, being compounded of *α*, privative, and *χρωμα*, *colour*.

Achromatic Teleſcopes, are teleſcopes contrived to remedy the aberrations in colours; ſee ABERRATION.—A particular account of the invention and conſtruction of theſe inſtruments will be found under OPTICS.

ACHTELING, a meaſure for liquids uſed in Germany. Thirty-two *achtelings* make a *heemer*; four *ſciltims* or *ſciltins*, make an *achteling*.

ACHYR, a ſtrong town and caſtle of the Ukrain, ſubject to the Ruſſians ſince 1667. It ſtands on the river Uorſklo near the frontiers of Ruſſia, 127 miles W. of Kiow, Long. 36. 0. Lat 49. 32.

ACHYRANTHES, in botany, a genus of the pentandria order, belonging to the monogynia claſs of plants, and aſſociating with the *Miſcellaneæ*, in the 54th Natural Order.

The characters are: The *calyx* is a double perianthium; the exterior one conſiſting of three lanced acute leaves, which are perſiſtent; the interior of five leaves, alſo perſiſtent. No *corolla*: The nectarium is five-valved ſurrounding the germen, bearded at the top, concave, and falling off. The *ſtamina* conſiſt of five filaments the length of the corolla, the antheræ are ovate and incumbent. The *piſtillum* has a topſhaped germen the ſtylus is filiform, and the length of the ſtamina; the ſtigma is villous, and divided into two ſegments. The *perianthium* is a roundiſh onecelled capſule, not gaping. The *ſeed* is ſingle and oblong.

Of this genus eight ſpecies are enumerated; but the character of the genus does not agree in them all.

The ſpecies are all natives of the Indies. Only one of them, the amaranthus, is commonly cultivated in botanical gardens, and that more for the ſake of variety than beauty. It grows to the height of three feet, with oblong pointed leaves. The flowers come out in long ſpikes from the extremities of the branches, and appear in July, the ſeeds ripening in September. Plants of this kind muſt be reared in a hot-bed, and may be tranſplanted when they have acquired ſufficient ſtrength. If kept in pots, and ſheltered during the winter in a warm green-houſe, they will live two or three years.

ACICANTHERA, in botany, the trivial name of a ſpecies of RHEXIA.

ACICULÆ, the ſmall pikes or prickles of the hedge-hog, echinus-marinus, &c.

ACIDALIUS (Valens) would, in all probability, have been one of the greateſt critics in theſe latter ages, had he lived longer to perfect thoſe talents which nature had given him. He was born at Witſtock, in Brandenburg; and having viſited ſeveral academies in Germany, Italy, and other countries, where he was greatly eſteemed, he afterwards took up his reſidence at Breſlaw, the metropolis of Sileſia. Here he remained a conſiderable time, in expectation of ſome employment; but nothing offering, he turned Roman-Catholic, and was choſen rector of a ſchool at Nieſſa. It is related, that about four months after, as he was following a proceſſion of the hoſt, he was ſeized with a ſudden phrenzy, and being carried home, expired in a very ſhort time. But Thuanus tells us, that his exceſſive application to ſtudy was the occaſion of his untimely death: and that his ſitting up a-nights in compoſing his conjectures on Plautus, brought upon him a diſtemper which carried him off in three days, on the 25th of May 1595, being juſt turned of 28. He wrote a Commentary on Quintus Curtius; alſo, Notes on Tacitus, on the twelve Panegyrics; beſides ſpeeches, letters, and poems. His poetical pieces are inſerted in the *Deliciæ* of the German poets; and conſiſt of epic verſes, odes, and epigrams. A little piece, printed in 1595, under the title of *Mulieres non eſſe homines*, "That women were not of the human ſpecies," was falſely aſcribed to him. But the fact was, that Acidalius happening to meet with the manuſcript, and thinking it very whimſical, tranſcribed it, and gave it to the bookſeller, who printed it. The performance was highly exclaimed againſt, inſomuch that the bookſeller being ſeized, he diſcovered the perſon who gave him the manuſcript, and a terrible outcry was made againſt Acidalius. A ſtory goes, that being one day to dine at a friend's houſe, there happened to be ſeveral ladies at table; who ſuppoſing him to be the author, were moved with ſo much indignation, that they threatened to throw their plates at his head. Acidalius, however, ingeniouſly diverted their wrath. In his opinion, he ſaid, the author was a judicious perſon, the ladies being certainly more of the ſpecies of *angels* than of *men*.—Mr Baillet has given him a place among his *Enfans Celebres*; and ſays, that he wrote a comment upon Plautus when he was but 17 or 18 years old, and that he compoſed ſeveral Latin poems at the ſame age.

ACIDALUS, a fountain in Orchomenus, a city of Bœotia, in which the Graces, who are ſacred to Venus, bathed. Hence the epithet *Acidalia*, given to Venus, (Virgil.)

ACIDITY, that quality which renders bodies acid.

ACIDOTON, in botany, the trivial name of a species of ADELIA.

ACIDS, in chemistry, the name by which one of the general classes of salts are distinguished. The characteristic marks of them are, 1. The peculiar taste which we call sour; though this does not hold universally: for the acid of arsenic, which in other respects manifests a strong acid power, has not this sour taste; nor are the volatile sulphureous acid, or those of *tungsten* and *molybdæna*, lately discovered by Mr Scheele, very distinguishable in this way. On the other hand, the strong acids of vitriol, nitre, and even sea-salt, are altogether caustic, and cannot be tasted until they have been largely diluted with water. 2. With water they combine into a fluid, the specific gravity of which is not a medium betwixt the water and acid separately taken. This holds good with the strong acids, which grow hot with water, and shrink into less bulk by reason of their emitting a quantity of the fire they contain: but whether it also takes place in the weaker acids, has not yet been ascertained; though the probability is, that it will take place in them also. 3. With spirit of wine, they unite into a very volatile and inflammable substance called *ether*. This must also be understood only of the strong mineral acids, or of the acetous when very much concentrated; for the acids of tartar, borax, arsenic, lapis ponderosus *(tungsten)*, and molybdæna, do not produce any. 4. They change the blue colour of vegetables to red, and heighten the colour of those which are already red.—This property is more universal than those we have yet mentioned; but the volatile sulphureous acid, those of tungsten and molybdæna, are exceptions. 5. They unite with all kinds of earths excepting the siliceous (though the fluor acid dissolves this also), with fixed and volatile alkalies, and with metals, in such a manner as to form compounds considerably permanent, and whose ingredients cannot be separated without some difficulty. This is the most universal and distinguishing mark; and there is not any acid but what shows its attraction for one or more of these substances, especially the alkaline salts. Oils and fats, indeed, will unite with alkalies; but they may be separated by the weakest known acids, so that there is no danger of confounding the two together. 6. When mixed with any fermentable liquor, they prevent that process from taking place: or, if it has already begun, they will put a stop to it. This also must be understood only of the stronger acids, or at least will require a considerable quantity of the weaker to effect it. 7. They cannot be frozen but in a degree of cold below the freezing point of water. This property is likewise not universal, but is remarkable only in the stronger acids.

1 General properties of acids.

The nature of acids has long been a matter of speculation, and of late has engaged the attention of philosophers very considerably. Some have supposed them to be simple chemical elements, while others imagined them to be composed of water and earth. Both these opinions, however, are inadmissible; the former, because we are certain that most acids may be entirely decomposed, and resolved into aerial vapours of different kinds, which could not happen if they were simple and unchangeable elements; the latter, because there is not the smallest probability that two ingredients, seemingly so insipid and inactive as water and earth could by their union produce a compound endowed with such powerful and even destructive properties as many of the acids possess.——The late discoveries concerning air of different kinds have suggested a new theory, first published by M. Lavoisier, and strenuously maintained by the French chemists, *viz*. That the acid principle is contained in the air; and, according as it combines itself with different substances, forms acids of different denominations.

2 Of the nature of acids.

3 Mr Lavoisier's hypothesis, that air is the acid principle.

This theory he considers as established by numerous indisputable experiments. These cannot here be detailed; but his conclusions from the whole are, That "*dephlogisticated air* enters as a constituent part into the composition of several acids, particularly the phosphoric, vitriolic, and nitrous; that this pure and highly respirable air is the constitutive principle of acidity common to all acids; and that the difference by which they are distinguished from each other is produced by the union of one or more principles besides this air, so as to constitute the particular form under which each acid appears." To dephlogisticated air in its state of fixity, therefore, he gives the title of the *acidifying* or *oxygenous* principle; and concludes farther from his experiments, 1. "That, when combined with the matter of fire, heat, and light, this principle produces dephlogisticated air; though he considers this position as not capable of absolute demonstration. It must not, therefore, be confounded with the following; which, he says, are supported by experiment and positive proofs. 2. That the same acidifying principle, combined with phlogistic substances or charcoal, forms fixed air. 3. That with sulphur it forms vitriolic acid. 4. That with nitrous air it forms nitrous acid. 5. That with Kunckel's phosphorus, it forms the phosphoric acid. 6. With sugar it forms the acid of sugar," &c.

4 Basis of dephlogisticated air supposed to be the acid principle.

The opinion of Mr Lavoisier concerning the composition of acids has in part been adopted by Mr Kirwan; who, in his treatise on Phlogiston, published in 1787, informs us that he is now of opinion "that dephlogisticated air becomes an essential constituent part of acids. All acids (he adds) consist of two principles: one peculiar to each, which, in the opinion of the antiphlogistians, has not as yet been decomposed, and consequently must be looked upon, relative to the present state of our knowledge, as a simple substance: the other, *pure air*, in a concrete state; that is, deprived of the greater part of its specific heat, and condensed into a small volume. The first they call the *acid basis*; the last, the *oxygenous* principle: thus the vitriolic acid, according to them, consists of sulphur as its basis, and pure air in a concrete state as its acidifying or oxygenous principle. This doctrine of the composition of acids has been admitted by some of the ablest defenders of phlogiston, and particularly by that distinguished philosophic chemist M. de Morveau, with this single modification, that the bases of acids contain phlogiston, which they lose on uniting to pure air: yet it seems very difficult to conceive how pure air can unite to phlogiston, a substance to which it has the greatest affinity, without forming a new compound endowed with very different properties from those which it possessed before such union. It seems therefore more reasonable to conclude, either that it forms water, as Mr Cavendish thinks; or fixed air, as I shall afterwards endeavour to prove."

5 Mr Kirwan's opinions.

In his explanation of the formation of acids, Mr Kirwan

Acids.

Kirwan first states the opinion of the antiphlogistians, viz. That the vitriolic acid, when considered abstractedly from the water it contains, always consists of sulphur (which they consider as a simple substance) united to a large portion of the oxygenous principle. "In my opinion (says he), it consists of a basis or radical principle, which, when saturated with phlogiston, constitutes sulphur; when saturated with fixed air, becomes common fixed vitriolic acid; and, when combined partly with the one and partly with the other, becomes volatile vitriolic acid. That sulphur, during its conversion into vitriolic acid, unites to air of some sort or other, is evident from the quantity of air which it absorbs, in whatever way that conversion is brought about. Thus, first, during combustion in respirable air, 100 grains of sulphur absorb 420 cubic inches of pure air, or about 143 grains: but the proportion of this pure air united with a given quantity of sulphur is not easily determined, because it is vitriolic air that is constantly formed; and this air essentially contains some portion of sulphur in solution, which portion is variable. Secondly, Pyrites, during their decomposition, absorb a considerable proportion of pure air, as Mr Lavoisier has observed: so also does liver of sulphur exposed to the atmosphere, for after some time it is converted into tartar vitriolate."

6 Whether pure air absorbed in the burning of sulphur continues to be so.

Mr Kirwan next proceeds to inquire, whether the air absorbed during the combustion of sulphur continues to be pure air; or whether it be converted into water or fixed air? He inclines to the latter opinions, for various reasons * which he specifies.

* Essay, p. 29.

7 Formation of the nitrous acid.

With regard to the nitrous acid, the experiments of Mr Cavendish, as well as of the French chemists, leave no room to doubt that it is produced during the deflagration of dephlogisticated and inflammable air. Mr Cavendish has shown that the nitrous acid may be formed by taking the electric spark in a mixture of three measures of phlogisticated air and seven of dephlogisticated air, or, in weight, one part of the former and about 2.6 of the latter. Mr Lavoisier, as has been already mentioned, supposes the nitrous acid to be composed of nitrous air united to the oxygenous principle, or basis of pure air; and 100 grains of dry nitrous acid consist of 64 grains of nitrous air united to 36 of pure air deprived of its specific fire; or, according to Mr Kirwan's calculation, 173 cubic inches of nitrous air and 105 of pure air. But nitrous air, as Mr Lavoisier himself has observed, is a compound; 100 grains of it, according to him, containing 32 of phlogisticated and 68 of pure air; consequently 64 grains of it contain 20.5 of phlogisticated air, and 43.5 of pure air. Hence, according to him, 100 grains of dry nitrous acid contain 79$\frac{1}{4}$ of pure air and 20$\frac{1}{4}$ of phlogisticated air.

8 Proportion of its constituent parts.

Mr Kirwan is of opinion that 100 grains of pure, dry, and colourless nitrous acid contain 38.17 grains of fixed air as its acidifying principle, 57.06 of nitrous basis, and 4.77 of phlogiston united to the nitrous basis. With regard to the nitrous basis itself, he says that one third of its weight is phlogisticated and two thirds dephlogisticated air, both in a concrete state.

"Nitrous basis (says Mr Kirwan), saturated with phlogiston, constitutes nitrous air: 100 grains of this basis take up nearly 22 of phlogiston. Hence the constituent principles of nitrous acid are fixed air, dephlogisticated air, phlogisticated air, and inflammable air, all in their concrete state.

"Red, yellow, green, and blue nitrous acids, when those colours are intense, owe their origin to the absorption of nitrous air; and consequently the proportion of their principles is variable, though all have the dephlogisticated acid for their ground. Thus Dr Priestley, having exposed strong pale-yellow nitrous acid, whose specific gravity could not be less than 1.400 to nitrous air, found that 100 grains of this acid absorbed, in two days, 247 cubic inches of nitrous air: now, 100 grains of this spirit must have contained, by my calculation, about 21 grains of dry acid, and these 21 grains took up 91.39 grains of nitrous air. When about 20 cubic inches of nitrous air were absorbed (that is, about seven grains), the acid became of an orange colour; when 50 cubic inches were absorbed (about 18 grains) it became green; and when nearly the whole was absorbed, it evaporated in the form of nitrous vapour, carrying off part of the water with it. Hence we see, that nitrous vapour consists of nitrous acid united to three or four times its weight of nitrous air and a little water."

9 Mr Lavoisier's theory contested.

Mr Kirwan next proceed to contest Mr Lavoisier's opinion, that nitrous air is a constituent principle of the nitrous acid. "The following experiments (says he) show that nitrous air is not a constituent principle of the nitrous acid, but that fixed air is. 1. There is not a doubt but that pure nitrous acid enters entire, and without decomposition, into fixed alkalis, and forms nitre. Now if nitre be distilled in a good earthen retort, it will be wholly decomposed; and so also will the acid itself, except a few drops which pass in the beginning of the distillation, and nothing but dephlogisticated air, more or less pure, and consequently intermixed with phlogisticated air and a slight proportion of fixed air, will be found: these, therefore, are its true constituent parts when disengaged from substances that cannot communicate phlogiston to it in any remarkable quantity, such as alkalies and earths; but if it be separated from substances that contain phlogiston, such as metals, it will then indeed be resolved into nitrous air and dephlogisticated air more or less pure, the phlogiston of the fixed air being detained by the metal. Mr Berthollet, who seems to have made the experiment with the greatest exactness, produced 714 cubic inches of dephlogisticated air from a troy ounce of nitre. This, however, was far from being of the purest kind; and Dr Priestley, Mr Berthollet, and Mr Succow, observed, that the air which first passes contains fixed air and renders lime-water turbid. Here then we have three of the constituent parts of the nitrous acid, with scarce any nitrous air; which the antiphlogistians suppose to be one of the constituent parts of the acid, and to make two thirds of its bulk when exhibited in an aerial form.

To obviate an objection that the quantity of fixed air thus obtained is too small to deserve to be ranked among the constituent parts of the nitrous acid, Mr Kirwan first inquires in what proportion it ought to exist there; and though this is variable, according to the different states of the nitrous acid with respect to phlogistication, he reckons it at one-third of the acid as existing in the nitre; and, from the decomposition of this

this fixed air, and the phlogiſton emitted by it of conſequence, he attributes the phlogiſtication and redneſs of the nitrous acid when expoſed to more heat. As a proof that fixed air may be decompoſed in this manner, he adduces two experiments of Dr Prieſtley. In one of theſe, dephlogiſticated air was obtained by means of acetous acid in that concentrated ſtate in which it is called *radical vinegar*. Having mixed half an ounce of the acid with two ounces of calcined whiting, he obtained from it 350 ounce-meaſures of air; of which about one third was fixed more in the firſt portion, and leſs in the laſt. The ſtandard of the reſiduum in the firſt portion was, 1.66, in the ſecond, 1.42, and in the third, 1.38; which is very near the goodneſs of common air. The whiting then weighed 760 grains. On adding a quarter of an ounce more of radical vinegar, and repeating the operation, 120 ounce-meaſures of air were obtained, and the whiting was reduced to 730 grains. A third operation, in which another quarter of an ounce of vinegar was added, reduced the matter to 489 grains: but the laſt portion of air extracted had no fixed air, and was conſiderably better than that of the atmoſphere.——The other experiment was made with lime-ſtone alone; from four ounces of the *white cryſtals*, of which 830 ounce-meaſures of air were obtained, the firſt portion of which had only one-fourth of fixed air, and the ſtandard of the reſiduum was never better than 1.56, nor worſe than 1.66; ſo that it was nearly of the goodneſs of common air.

Our author then proceeds to relate ſeveral other experiments in which the nitrous acid was decompoſed; but a particular relation of them would ſwell this article beyond its due bounds. At laſt, however, he concludes in the following manner. "If ſpirit of nitre be made to boil, and its vapour received through a red-hot earthen tube, it will be converted into dephlogiſticated air, in which a portion both of phlogiſticated and fixed air is found, as Dr Prieſtley has diſcovered: the water through which this air paſſes will alſo contain fixed air. Here then are ſeveral ways of decompoſing the nitrous acid; and in one only it is reſolved into nitrous and dephlogiſticated air; and in this way it may, at leaſt, be ſtrongly ſuſpected to receive an addition of another principle. Why then ſhould

10 Fixed air one of the elements of nitrous acid.

theſe be regarded as its conſtituent principles? And as in the two ſimpleſt methods of decompoſition, in which the re-action of no foreign ſubſtance can be ſuſpected, it appears in the form of dephlogiſticated, phlogiſticated, and fixed air (the former always containing a portion of the two laſt), why then ſhould not theſe be accounted its true conſtituent parts?——This theory

11 How nitrous acid is naturally generated.

is further confirmed by reflecting on the manner in which nitrous acid is generated by nature. Mr Thouvenel found that this acid is conſtantly produced when chalk is expoſed to a mixture of putrid air and common air, or putrid and dephlogiſticated air; but if the putrid air be paſſed through lime-water, it is never generated; and that it is rarely produced by the expoſure of quick-lime or fixed alkalis to theſe airs. The reaſon that alkalis, though aërated, are not ſo proper, is, that they do not combine with phlogiſticated air as calcareous earths do. Mr Cavendiſh, indeed, produced nitrous acid without any apparent mixture of fixed air; but the atom of it neceſſary for the formation of the ſmall quantity of nitrous acid he produced (about one-third of a grain), might well be contained in the phlogiſticated air he employed, or perhaps formed in the operation."

Having thus far ſtated the different opinions of the moſt celebrated French and Engliſh philoſophers concerning the compoſition of acids, it is neceſſary to take notice of ſome experiments made by Mr Watt, in order to determine whether the dephlogiſticated air produced from nitre really proceeds from a decompoſition of the acid, or what quantity of the latter is required to conſtitute a determinate quantity of the former. To aſcertain this *, 240 grains of mercury were put into a glaſs retort with 480 grains of diluted dephlogiſticated nitrous acid, which was the quantity neceſſary to diſſolve the whole of the mercury; and as ſoon as the common air was expelled, a proper veſſel was applied to receive the air produced in the operation. Sixteen ounce-meaſures of nitrous air came over during the ſolution, and on changing the receiver, a quantity of dilute, but highly phlogiſticated nitrous acid, was obtained. The air receiver being again applied, four ounce-meaſures of ſtrong and pure nitrous air were obtained, which, by the dephlogiſticated air that aroſe immediately after, were reduced to half an ounce-meaſure. The production of dephlogiſticated air continued very rapid, the mercury being all the while received, until the operation was ended by the diſtillation or ſublimation of the whole of the mercury. Two hundred and eighteen grains of the metal were obtained in its running form, and 22 remained in the form of an orange-coloured ſublimate in the upper part of the retort.—The 16 ounce-meaſures of nitrous air, firſt obtained, were then converted into nitrous acid by the gradual admiſſion of common air, and then added to the water in the baſon in which the receiver had been inverted; the whole quantity being about two quarts, and very acid to the taſte, ſparkling at the ſame time with nitrous air. To determine the quantity of acid thus recovered, as well as that which remained in the ſublimate, a ſolution of alkali of tartar was made; and by experiment it was found, that 120 grains of the acid, originally employed in diſſolving the mercury, ſaturated 352 grains of this ſolution; the orange coloured ſublimate and all the acid liquor recovered being ſaturated by 1395 grains of the ſame. Hence it appears, by the rule of proportion, that out of 480 grains of nitrous acid originally employed, only five were loſt; "a ſmaller quantity (as Mr Watt juſtly obſerves) than what might reaſonably be ſuppoſed to be loſt in the proceſs by the extreme volatility of the nitrous acid." His concluſion therefore is, that "the nitrous acid does not enter into the compoſition of dephlogiſticated air: it ſeems only to ſerve to abſorb phlogiſton from the watery part of the mercurial nitre."

12 Experiments by Mr Watt, which ſeem contrary to Mr Kirwan's doctrine.

* Philoſ. Tranſ. v. lxxiv. p. 339.

This experiment was repeated with cubic nitre, and only 30 ounce-meaſures of air diſtilled from an ounce of the mineral alkali exactly ſaturated with nitrous acid. The water through which the air paſſed was acid, and the reſiduum in the retort alkaline; but on mixing the two together, the ſolution was found to be exactly neutral by every poſſible teſt.

Not ſatisfied with theſe experiments, Mr Watt diſtilled an ounce (480 grains) of common nitre, ſtopping the proceſs when 50 ounce-meaſures of air had been produced. This air had a ſtrong ſmell of the nitrous

nitrous acid, from which it could not be freed by washing with the water in the bason. The residuum in the retort was alkaline as before, and the water slightly acid; nor was the saturation completed by mixing the two together. Ten grains of weak nitrous acid, 105 grains of which contained the acid of 60 of nitre, completed the saturation. These ten grains contained the acid of 57 grains of nitre; which, by Mr Kirwan's experiments, is equal to two grains of real nitrous acid. "We have therefore (says Mr Watt) 34 grains weight of dephlogisticated air produced, and only two grains of real acid missing; and it is not certain that even this quantity was destroyed, because some portion of the glass of the retort was dissolved by the nitre, and some part of the materials employed in making the glass being alkali, we may conclude, that the alkali of the nitre would be augmented by the alkali of that part of the glass it had dissolved; but as the glass cracked into small pieces on cooling, and some part of the coating adhered firmly to it, the quantity of the glass that was dissolved could not be ascertained."

13 Answered by Mr Kirwan.

To avoid the force of objections drawn from these experiments, and which seem ready to overthrow his hypothesis, as well as that of Mr Lavoisier entirely, Mr Kirwan makes the following reply.——"My ingenious friend Mr Watt, as well as Mr Cavendish, are of opinion, that the whole quantity of dephlogisticated air, produced from the distillation of nitre, arises from the dephlogistication of the water it contains, it being decomposed by the nitrous acid, which then becomes phlogisticated. This opinion is exposed to insurmountable difficulties. For, in the first place, nitre affords dephlogisticated air at the rate of 146.125 cubic inches for every hundred grains of nitre, which, by the proper allowances for phlogisticated air, should weigh 46.77 grains: but then dephlogisticated air is only one of the constituent parts of water, for it contains 13 *per cent.* of inflammable air, that is to say, 87 grains of dephlogisticated air: to form 100 grains of water requires an addition of 13 grains of inflammable air; consequently 46.77 grains of dephlogisticated air require nearly 7 of inflammable air, and would then form 53.77 grains of water, which exceeds half the weight of the nitre; a quantity of water, as Mr Watt owns, certainly inadmissible. Mr Watt found, that the water over which the air proceeding from the decomposition of 960 grains of nitre had been received, contained only the acid belonging to 120 grains of nitre; and even this small quantity he inferred only from my experiments. But my experiments are totally inapplicable in this case; for I used only the dephlogisticated nitrous acid: and alkalis are saturable by a much smaller quantity of phlogisticated than of dephlogisticated acids, as is evident in the case of the *deplogisticated marine* acid, as Stahl long ago observed; for he says, that the volatile acid of sulphur saturates 10 times as much alkali as the fixed. Mr Bergman and Mr Scheele observed, that melted nitre is still neutral, though it be phlogisticated; therefore it is air, and not water, which it wants. Accordingly Dr Priestley found it to injure common air by attracting its dephlogisticated part: but if it be kept in fusion for some time, it loses its acid, and becomes alkaline; and the air it receives must surely be deemed rather to recompose the acid than to form water; of whose formation, in the temperature of the atmosphere, we have no sort of proof. On the contrary, the impossibility of accounting for the loss of acid in this case is an evident proof of the fallacy of that hypothesis.—By Mr Lavoisier's analysis, 100 grains of nitre contain 57 of caustic alkali; by Mr Bergman's, 49; by Mr Wenzel's, 52; by Mr Wiegleb's, 45½; by mine, 63: the mean of all which is, 53½; which leaves 46.5 for acid and water, which is very nearly the weight of the air expelled. The different quantity of acid assigned by different persons to nitre, is in part owing to its degree of phlogistication in nitre. I believe at present that 100 grains of nitre contain 34 of acid, and about 12 of water, including the water in the acid and that of crystallization."

14 Quantity of acid contained in nitre.

15 Principles of the marine acid.

Mr Kirwan next proceeds to consider, in a manner similar to that above related, the composition of the other acids.—The marine acid, according to him, consists of a peculiar basis united to phlogiston, and a certain quantity of fixed air; to both of which the basis seems to have a strong affinity. On depriving it of this phlogiston, the affinity of the acid to fixed air becomes much stronger, and it saturates itself so largely with it, that its attractions for other substances, containing little or no phlogiston, become nearly as weak as those of fixed air itself when equally condensed; but with respect to bodies that contain a considerable quantity of phlogiston, its affinities are much stronger, as its basis attracts the phlogiston, while those bodies attract its excess of fixed air. In this state it does not expel fixed air from aërated fixed alkalis or earths until it is heated; and then dephlogisticated air separates from it, and it becomes, in all respects, common marine acid. For as it contains an excess of fixed air, it acts nearly as an acid of the same nature; but when heat is applied, its basis dephlogisticates its own fixed air, which then becomes dephlogisticated air, at the same time that the acid becomes common marine acid, and acts as such.

91 Mr Lavoisier's opinion.

Mr Lavoisier, and other philosophers, who deny the existence of phlogiston, are of opinion, that the common marine acid consists of a peculiar basis united to a small proportion of pure air, or oxygenous principle, and the dephlogisticated marine acid differs from it only by containing an excess of this principle.—This opinion they are chiefly induced to maintain, because the acid in its dephlogisticated state is procured by distilling common marine acid from manganese; and the manganese, if distilled by itself, before the acid is distilled from it, affords dephlogisticated air; but after the acid is distilled from it, it yields none.—"This experiment, however, (says Mr Kirwan), proves no more but that the manganese contains some air which is dephlogisticated during the calcination. And that this air is fixed air, appears from the following considerations: The black calx of manganese almost always gives out fixed air at first, before any dephlogisticated air appears; whence it is natural to think, that the dephlogisticated air proceeds from the dephlogistication of the fixed. And hence, if it be distilled with filings of iron, or in a gun-barrel, it scarce gives out any other than fixed air; if at any time it gives out dephlogisticated air, with little or no mixture of fixed air, this is owing to a very perfect dephlogistication of the calx, and to its containing very little moisture. Thus Dr Priestley,

17 Contested by Mr Kirwan.

Acids. having passed the steam of boiling water through manganese heated in an earthen tube, obtained a very large quantity of fixed air, and scarce any other; though on repeating this experiment with manganese well freed from calcareous earth, I obtained a large portion of dephlogisticated air; but I believe much depends on the degree of heat to which the tube is subjected. But having distilled manganese, which yielded of itself some fixed air with common spirit of salt, I obtained dephlogisticated marine acid, and not a particle of fixed air; which shows that this last combined with the dephlogisticated basis, and formed the dephlogisticated acid. Mr Hermstadt having dissolved the black calx in common marine acid, and precipitated it with an aërated fixed alkali, obtained, as usual, a white precipitate; which, when heated, afforded a great part of the fixed air it had absorbed from the alkali; but when heated to such a degree as to be of a brown red colour, and consequently dephlogisticated, it converted common spirit of salt into a dephlogisticated acid, which could proceed only from some fixed air yet unexpelled: Yet if sal-ammoniac be distilled with the black calx of manganese, it will be expelled in a caustic state; for the fixed air unites to the dephlogisticated marine basis in preference to the volatile alkali."

18 Decisive experiment in his favour.

Several other experiments are related by Mr Kirwan, which the limits of this article will not allow us to insert; but the following, he is of opinion, fully confirms his hypothesis, and subverts that of the antiphlogistians. "Six cubic inches of inflammable air were mixed with as much dephlogisticated marine air over lime-water. In about 10 minutes after the greater part of the diminution had taken place, a white cloud appeared on the surface (*a*) of the lime-water, and by agitation it became still more turbid. As it was possible that the manganese might be mixed with calcareous earth, some dephlogisticated marine air was extracted from another portion of it, and received on lime-water; but it was wholly absorbed, without forming the least cloud, tho' there was lime enough; for, on adding aërated water, a cloud appeared."

19 Phosphoric acid.

The other acids particularly treated of by Mr Kirwan are the phosphoric and saccharine. In his treatise on the former, he adopts the analysis of Mr Lavoisier, changing only his acid principle of dephlogisticated for fixed air. From this it appears, that the phosphoric acid consists of a peculiar basis united to 2.265 of its weight of the acid principle; or, in other words, 100 grains of dry phosphoric acid contains about 69 of fixed air and 31 of its peculiar basis: 100 grains of the phosphoric basis take up 226.5 of fixed air, or 32.9 of phlogiston when it becomes phosphorous; and 100 grains of phosphorus contain 75.24 of basis and 24.76 of phlogiston.—The basis of this acid is the only one that can be procured free, both from the phlogiston and the acidifying principle; it is called, though improperly, as it is not soluble in water, the *glacial phosphoric* acid. Mr Lavoisier and others are of opinion, that phosphorus is a simple substance containing no phlogiston, and that the acid consists of the oxygenous principle united to it.

20 Saccharine acid.

With regard to the acid of sugar, Mr Kirwan observes, that sugar itself is a compound of fixed air with a much larger proportion of inflammable air, and some water, all condensed to a degree of which we are ignorant, but retaining, upon the whole, much more specific heat than either oil or charcoal; tho' he seems inclined to the hypothesis of Mr Morveau, that this substance has for its basis a fine ethereal oil, to which a large proportion of condensed inflammable air is superadded. The acid of sugar, then, according to him, consists of this peculiar basis deprived of its superfluous phlogiston, and united to a great quantity of fixed air in a concrete state. He is also of opinion, that it does not exist ready formed in the sugar, but is produced in the operations that substance undergoes: that it derives most of its acid principle from the nitrous acid employed; the nitrous basis taking up the phlogiston, and the fixed air of the nitrous acid combining with the saccharine basis. He contests strongly an opinion of Mr Lavoisier, that sugar is a sort of *charcoal*, which, uniting with the oxygenous principle of the nitrous acid, decomposes it, sets loose the nitrous air, and forms the saccharine acid; and that, towards the end of the operation, the saccharine acid itself is decomposed; the consequence of which is the production of fixed air, which, according to him, is only the oxygenous principle combined with charcoal. On this Mr Kirwan remarks, 1. "That, according to this theory, the acid of sugar should be the same with fixed air, since both are composed of the oxygenous principle united with charcoal; or, if Mr Lavoisier should reply, that sugar is different from common charcoal, he reminds him, that, according to his own table of affinities, the oxygenous principle has a much stronger attraction for charcoal than for sugar, and consequently that the latter ought to be decomposed by the former; nay, that it should be regenerated by various metallic substances, which, according to him, have a greater attraction for this principle. 2. According to this hypothesis, the saccharine acid ought to weigh more than the sugar employed in the operation; which is so far from being the case, that it is universally agreed to be much less; Bergman making it only $\frac{1}{3}$d, Mr Chaptal from $\frac{1}{3}$d to $\frac{2}{5}$ths, and Mr Sage $\frac{7}{16}$ths. 3. If the saccharine acid consisted of sugar, or consisted of that substance undecomposed, and barely united to the oxygenous principle, it ought to be formed by treating sugar with the black calx of manganese, or with dephlogisticated marine acid; both of which, according to him, have less attraction for the oxygenous principle than sugar. Lastly, (says Mr Kirwan), if the acid of sugar be distilled, it is wholly converted into water, fixed inflammable air, and not a particle of coal or dephlogisticated air is found in it. It is not therefore reasonable to look on either of them as its constituent principles; but as fixed air alone can be extracted from all vegetable acids, it seems to be the true acidifiable principle.

21 Fixed air the acid principle, according to Mr Kirwan.

Having given a view of the present opinions relative to the original formation of acids, it remains to treat a little more particularly of each of the different kinds.

(*a*) On mixing these, a dense white cloud appears; one half the bulk of both disappears, and the residuum explodes like a mixture of inflammable and dephlogisticated air.

kinds. They are divided into three different claſſes, expreſſive of their origin, *viz.* the Mineral, Vegetable, and Animal. The mineral acids are thoſe of vitriol, nitre, ſea-ſalt, borax, amber, fluor, arſenic, tungſten, molybdæna, &c. The vegetable are, thoſe of vinegar, tartar, ſugar, benzoin, apples, citrons, lemons, tamarinds, ſorrel, cork, &c. The animal acids are, the microſmic or acid of urine, and that of bones, both of which are alſo called the *phoſphoric*, though this might be accounted a vegetable acid, as it is procured by diſtilling muſtard and ſome other vegetables by a violent fire. Beſides theſe, there are the acids of ants, waſps, bees, ſilk-worms, milk, &c. It has alſo been diſcovered, that the human calculus is formed for the moſt part of a peculiar acid, which has received the name of *lithiaſic* acid. Laſtly, As an acid diſtinct from all theſe, we may now add *fixed air*, by ſome called the *aerial*, and by others the *cretaceous* acid; the latter appellation it derives from *creta*, chalk, becauſe it is found in that ſubſtance in great quantity. See Aerology.

22 Acids, how divided.

23 Enumeration.

24 General account of their attractions for alkalis, &c.

The general properties of acids have already been enumerated; the moſt remarkable of which is their attraction for alkaline ſalts, earths, and metals. Though this is common to all, yet very conſiderable differences are obſerved among them in this reſpect, and on thoſe differences depend almoſt all the phenomena of that part of Chemistry which treats of ſalts. As theſe phenomena are particularly conſidered under that article, we ſhall here only in general take notice, that the three acids named the *vitriolic*, *nitrous*, and *marine*, are the ſtrongeſt of them all; that is, if any other acid be united to an alkali, earth, or metal, the union will be broken by adding to that compound any of the three acids juſt mentioned. Neither are theſe equal in power among themſelves; for the vitriolic is ſtronger than the nitrous, and the nitrous ſtronger than the marine. The rule, however, is liable to certain exceptions and variations, depending chiefly on the circumſtances of heat or cold, moiſture or dryneſs, and particularly on the ſtate of the marine acid with regard to its being in the form of an aqueous fluid or reduced to a dry vapour. In this laſt caſe it ſeems ſtronger than either the vitriolic or nitrous; and even when in an aqueous ſtate, both the nitrous and marine acids, when added in great quantity, ſeem to oppreſs and overwhelm the ſtronger vitriolic acid, ſo that they will partly expel it from an alkaline ſalt. This does not depend on the mere quantity of acidity they poſſeſs: for the acetous acid may be concentrated to ſuch a degree as to become ſtronger in this reſpect than ſpirit of ſalt; yet it will always be inferior in point of real ſtrength, when tried with an alkali in competition with the latter. The aerial acid is the weakeſt of all; and may be expelled not only by vinegar, but by the acid juices of fruits, tartar, and the acids of tungſten and molybdæna.

Some acids have the property of reſiſting the fire, and melting into a kind of glaſs, ſuch as that of borax and phoſphorus. This circumſtance gives them an advantage over the ſtronger acids which are volatile; and thus the two juſt mentioned, as well as thoſe of arſenic and tungſten, will, in a very ſtrong heat, expel the acid of vitriol itſelf, though the latter will, in the cold, expel any one of them with great eaſe.

Both the vitriolic and nitrous acids have a very ſtrong attraction for phlogiſton; and unite with certain oily and inflammable matter ſo vehemently as to occaſion great heat, and ſometimes even violent and unextinguiſhable flame. This is particularly the caſe with the nitrous acid, or with a mixture of the two; and indeed the nitrous acid, though weaker than the vitriolic, ſhows itſelf in every inſtance to be far more active, and to perform all its operations with vaſtly greater rapidity, than the other. All theſe particulars, however, as they properly fall under the article Chemistry, are there explained at length: together with the origin and peculiar methods of preparing each of the acids, and the various uſes to which they may be applied in arts and manufactures. See alſo their different titles as they occur in the order of the alphabet; as, Nitre, Vinegar, Vitriol, &c.

ACIDULOUS denotes a thing that is ſlightly *acid*; it is ſynonymous with the word *ſub-acid*.

ACIDULÆ. Mineral waters that contain a briſk ſpirit, when unaccompanied with heat, are thus named; but if they are hot alſo they are called Thermae. See Mineral Waters.

ACIDULATED, a name given to medicines that have an acid in their compoſition.

ACIDUM aereum, the ſame with *Fixed Air*.

Acidum pingue, an imaginary acid, which ſome German chemiſts ſuppoſed to be contained in fire, and by combining with alkalies, lime, &c. to give them their cauſtic properties; an effect which is found certainly to depend on the loſs of their fixed air.

ACILA, Ocila, or Ocelis (anc. geog.), a ſtaple or mart town in Arabia Felix, on the Arabic gulf, from which, according to Pliny, they ſet ſail for India. Now *Ziden*.

ACILIUS GLABRIO (Marcus), conſul in the year of Rome 562, and 211 years before the Chriſtian æra, diſtinguiſhed himſelf by his bravery and conduct in gaining a complete victory over Antiochus the Great, king of Syria, at the ſtreights of Thermopylæ in Theſſaly, and on ſeveral other occaſions. He built the Temple of piety at Rome, in conſequence of a vow he made before the abovementioned battle: and the reaſon of his giving it that name is very remarkable. The ſtory is mentioned by Pliny, Valerius Maximus, and others. See the article Piety.

ACINIPPO (anc. geog.), a town of Bætica; its ruins, called *Ronda la Viega*, are to be ſeen near Arunda, in the kingdom of Granada.

ACINODENDRUM, in botany, the trivial name of a ſpecies of Melastoma.

ACINOS, in botany, the trivial name of a ſpecies of Thymus.

ACINUS, or Acini, the ſmall protuberances of mulberries, ſtrawberries, &c. and by ſome applied to grapes. Generally it is uſed for thoſe ſmall grains growing in bunches, after the manner of grapes, as *Liguſtrum*, &c.

ACIS, in fabulous hiſtory, the ſon of Faunus and Simetheis, was a beautiful ſhepherd of Sicily, who being beloved by Galatea, Polyphemus the giant was ſo enraged, that he daſhed out his brains againſt a rock; after which Galatea turned him into a river, which was called by his name.

Acis, (Ovid, Theocritus); a river of Sicily, running from a very cold ſpring, in the woody and ſhady foot of mount Ætna, eastward into, and not much above a mile from the sea, along green and pleasant banks, with the speed of an arrow, from which it takes its name. It is now called *Aci Iaci*, or *Chinci*, according to the different Sicilian dialects: Antonine calls it *Acius*. Also the name of a hamlet at the mouth of the *Acis*.

ACKNOWLEDGMENT, in a general sense, is a person's owning or confessing a thing; but, more particularly, is the expression of gratitude for a favour.

Acknowledgment-Money, a certain sum paid by tenants, in several parts of England, on the death of their landlords, as an acknowledgment of their new lords.

ACLIDES, in Roman antiquity, a kind of missive weapon, with a thong affixed to it, whereby to draw it back. Most authors describe it as a kind of dart or javelin; but Scaliger makes it roundish or globular, and full of spikes, with a slender wooden stem to poise it by.

ACLOWA, in botany, a barbarous name of a species of COLUTEA. It is used by the natives of Guinea to cure the itch: They rub it on the body as we do unguents.

ACME, the top or height of any thing. It is usually applied to the maturity of an animal just before it begins to decline; and physicians have used it to express the utmost violence or crisis of a disease.

ACMELLA, in botany, the trivial name of a species of SPILANTHUS.

ACMONIA, and AGMONIA, in Peutinger's map, a town of Phrygia Major, now in ruins. The inhabitants are called *Acmonenses* by Cicero, and the city *Civitas Acmonensis*. Also a city of Dacia (Ptolemy), on the Danube, near the ruins of Trajan's bridge, built by Severus, and called *Severicum;* distant 12 German miles from Temeswar, to the south-east.

ACNIDA, VIRGINIAN HEMP, in botany, a genius of the diœcia order, belonging to the pentandria class of plants; and, in the Natural Order, associating with the *Scabridæ* (53). The characters are: In the *male*, the *calyx* is a perianthium consisting of five leaves, ovate, concave, acute, and membranous on the margin. No *corolla*. The *stamina* consist of five very short capillary filaments; the antheræ are versatile, two-celled, and forked at both ends.—*Female* on a separate plant; of which the *calyx* consists of an involucrum many-leaved, linear, and deciduous; and a perianthium two-leaved, very small, and persistent. No *corolla*. The *pistillum* has an ovate germen; the styli are five, long, reflected, and downy; the stigmata are simple. The *pericarpium* is an egg-shaped fruit, compressed, many-angled, sulcated, and covered with a succulent calyx. The *seed* is solitary, round, and compressed. There is only one species of it, *viz.* the acnida cannabida. It is a native of Virginia; but rarely cultivated in Europe, except for the sake of variety. It has little beauty, and at present is applied to no useful purpose.

ACNUA, in Roman antiquity, signified a certain measure of land, near about the English rood, or fourth part of an acre.

ACOEMETÆ, or ACOEMETI, in church-history; or, Men who lived without sleep: A set of monks who chanted the divine service night and day in their places of worship. They divided themselves into three bodies, who alternately succeeded each other, so that their churches were never silent. This practice they founded upon the precept, *Pray without ceasing*. They flourished in the east about the middle of the 5th century. There are a kind of acoemeti still subsisting in the Roman church, *viz.* the religious of the holy sacrament, who keep up a perpetual adoration, some one or other of them praying before the holy sacrament day and night.

ACOLUTHI, or ACOLUTHISTS, in antiquity, was an appellation given to those persons who were steady and immoveable in their resolutions: and hence the stoics, because they would not forsake their principles, nor alter their resolutions, acquired the title of Acoluthi. The word is Greek, and compounded of α, priv. and κολευθος, way; as never turning from the original course.

ACOLUTHI, among the ancient Christians, implied a peculiar order of the inferior clergy in the Latin church; for they were unknown to the Greeks for above 400 years. They were next to the sub-deacon; and we learn from the fourth council of Carthage, that the archdeacon, at their ordination, put into their hands a candlestick with a taper, giving them thereby to understand that they were appointed to light the candles of the church; as also an empty pitcher, to imply that they were to furnish wine for the eucharist. Some think they had another office, that of attending the bishop wherever he went. The word is Greek, and compounded of α, priv. and κωλυω, to hinder or disturb.

ACOLYTHIA, in the Greek church, denotes the office or order of divine service; or the prayers, ceremonies, hymns, &c. whereof the Greek service is composed.

ACOMA, a town of North America, in New Mexico, seated on a hill, with a good castle. To go into the town, you must walk up 50 steps cut out of the rock. It is the capital of that province, and was taken by the Spaniards in 1599. W. Long. 104. 15. L. 35. 0.

ACOMAC or ACCOMACK, the name of a county in Virginia. It is on the eastern side of the Chesapeak bay, on a slip of land, called the *eastern shore*.

ACOMINATUS (Nicetas), was secretary to Alexius Comnenus and to Isaacus Angelus successively: he wrote an history from the death of Alexius Comnenus 1118, where Zonaras ended his, to the year 1203, which has undergone many impressions, and is much applauded by the best critics.

ACONITE. See ACONITUM.

Winter Aconite. See HELLEBORUS.

ACONCROBA, in botany, the indigenous name of a plant which grows wild in Guinea, and is in great esteem among the natives for its virtues in the small-pox. They give an infusion of it in wine. The leaves of this plant are opake, and as stiff as those of the philyrea; they grow in pairs, and stand on short footstalks; they are small at each end, and broad in the middle; and the largest of them are about three inches in length, and an inch and quarter in breadth in the middle. They are of a dusky colour on the upper side, and of a pale green underneath.

ACONITI, in antiquity, an appellation given to some of the ATHLEIÆ, but differently interpreted. Mercurialis understands it of those who only anointed their bodies with oil, but did not smear themselves over with dust, as was the usual practice.

ACONITUM, ACONITE, WOLFSBANE, or MONKSHOOD; a genus of the trigynia order, belonging to the polyandria class of plants. In the natural order, it associates with the *Multisiliquæ*, 26. The characters are: There is no *calyx*. The *corolla* consists of five unequal petals opposite in pairs; the highest helmet-tubed, inverted, and obtuse; the two lateral ones, broad, roundish, opposite, and converging; the two lowest, oblong, and looking downwards: The nectaria are two, piped, nodding, and sitting on long subulated peduncles, and concealed under the highest petal: The scales are six, very short, coloured, and in an orb with the nectaria. The *stamina* consist of numerous small subulated filaments; the antheræ are erect and small. The *pistillum* has three [five] oblong germens, ending in styli the length of the stamina; the stigmata are simple and reflected. The *pericarpium* has three or five univalve capsules gaping inward. The *seeds* are numerous, angular, and wrinkled.

Species. 1. The lycoctonum, or yellow wolfsbane, grows upwards of three feet high, flowers about the middle of June, and if the season is not warm will continue in flower till August. 2. The altissimum, or greatest yellow wolfsbane, grows upwards of four feet high, and the spikes of its flower are much longer in this sort than the former. 3. The variegatum, or lesser wolfsbane, seldom grows more than two feet high, it carries blue flowers, and the spikes of them are much shorter than either of the two last. 4. The anthora, or wholesome wolfsbane, flowers in the middle of August, and often continues in beauty till the middle of September; its flowers are not large, but are of a beautiful sulphur-yellow colour. 5. The napellus, bears large blue flowers, which appear in August, and make a pretty appearance. There are two or three varieties of this kind; one with white, another with rose-coloured, and a third with variegated flowers: but these are only varieties which often change. 6. The Pyramidale, or common blue monkshood, bears a long spike of blue flowers, which appear sooner than any of the other sorts, being so early as June, or sometimes even May. The spikes of flowers are upwards of two feet long, so that it makes a pretty appearance; the seeds are ripe in September. 7. The alpinum, or large-flowered monkshood, flowers in August, and will grow to the height of five feet in good ground; the flowers are very large, of a deep blue colour, but not many upon each spike. 8. The pyreniacum, or Pyrenean monkshood, flowers in July. It grows about four feet high, and carries a long spike of yellow flowers. 9. The cammarum, grows about four feet high, and flowers in the beginning of July. 13. The orientale, or eastern monkshood, grows sometimes more than six feet high, and bears a white flower.

Culture. All these species, except the last, are natives of the Alps, the mountains of Germany, Austria, and Tartary; so require a cool shady situation, except the wholesome wolfsbane, which must have an open exposure. They thrive better in a moist than dry soil: but the ground must not be so wet as to have the water standing near their roots in the winter-time. They may all be propagated by sowing their seeds in autumn, upon a north border, where they are screened from the sun. The plants will come up in the spring, when they must be kept clean from weeds during the summer-months: and in very dry seasons, if they are frequently refreshed with water, their growth will be greatly promoted. The following autumn they should be transplanted into shady borders, in rows a foot asunder, and the plants six inches distant from one another. In this situation they may remain two years, when they will carry flowers, and so may be transplanted to those places where they are to remain. The eastern monkshood is a native of the Levant, from whence the seeds of it were first sent by Dr Tournefort to the royal garden at Paris, from whence some other gardens have been furnished with seeds. It is very rare in Europe at present.

Qualities. Since the time of Theophrastus, most of the species of monkshood have been reckoned a deadly poison both to men and brutes. Dioscorides, however, recommends the external application of common monkshood for pains of the eyes. The flowers of a great many species communicate their noxious quality by being smelled to; and those of the species called *napellus* being placed on the head, occasion a violent megrim. Of the bad qualities of these plants we sometimes avail ourselves to get rid of vermin. A decoction of the roots destroys bugs; the same part being powdered, and administered in bread or some other palatable vehicle to rats and mice, corrodes and inflames their intestines, and soon proves mortal. The juice of the plant is used to poison flesh with, for the destruction of wolves, foxes, and other ravenous beasts. The best antidote to the poison of the different monkshoods is said to be the root of the anthora, a species of the same genus, hence termed *healthful* or *wholesome monkshood*. The same plant is regarded as efficacious against bites of serpents and other venomous creatures. The roots have a bitter acrid taste; the leaves are only bitter: the former are chiefly used in medicine; and, besides the excellent quality just mentioned, are stomachic, and promote perspiration. The peasants, who gather the plants on the Alps and Pyrenees, are said to use it with success against the biting of mad dogs, and to cure the cholic. It is remarkable, that the monkshoods with blue flowers are much more virulent than the yellow or white-flowered kinds. Miller asserts that the huntsmen of the wolves and other wild beasts on the Alps, dip their arrows into the juice of those plants, which renders the wounds made by them deadly.

That the anthora is an antidote to the poison of the rest of the species, is not considered as a fact sufficiently established. Of the effects of the above, indeed, and other vegetable poisons, medical writers give but a confused account. In general, those which are not of the narcotic kind, nor excite violent vomitings and purgings, produce their pernicious effects by irritating the nervous coats of the stomach and intestines, so as to occasion violent convulsions, not only in them, but, through the whole body. The proper cure is evacuation by vomit: but this is not to be obtained without some difficulty; because there is usually such a contraction about the upper orifice of the stomach, that nothing

thing can either be swallowed or thrown up. In this case, an infusion of tobacco has been recommended, and may probably be of service: for being itself of a very stimulating nature, it may for a moment take off the violent spasms occasioned by the poison; in which case, a violent vomiting will immediately ensue.—The stomach being thoroughly emptied, and deglutition rendered easy, the cure may be completed by oily and mucilaginous medicines. On account of the poisonous qualities of monkshood, no species of it should be planted where children have access, lest they should suffer by putting the leaves or flowers in their mouths, or rubbing them about their eyes; for the juice of the leaves will occasion great disorder by being only rubbed upon very tender flesh; and the farina of the flowers, when blown into the eyes, causes them to swell greatly.

ACONTIAS, in zoology, an obsolete name of the anguis jaculis, or dart-snake, belonging to the order of amphibia serpentes. See ANGUIS.

ACONTIUM, ακοντιον, in Grecian antiquity, a kind of dart or javelin, resembling the Roman pilum.

ACONTIUS (James), a philosopher, civilian, and divine, born at Trent in the 16th century: he embraced the reformed religion; and, coming into England in the reign of queen Elizabeth, was much honoured by her, which he acknowledges in a book dedicated to that queen. This work is his celebrated Collection of the Stratagems of Satan, which has been so often translated, and borne so many editions.

ACOSTAN, a mountainous island in the north seas between Asia and America, observed by captain Cook.

ACORN, the fruit of the oak-tree. See QUERCUS.

ACORN, (in sea-language), a little ornamental piece of wood, fashioned like a cone, and fixed on the uppermost point of the spindle, above the vane, on the masthead. It is used to keep the vane from being blown off from the spindle in a whirlwind, or when the ship leans much to one side under sail.

ACORUS, CALAMUS AROMATICUS, SWEET FLAG, or SWEET RUSH: A genus of the monogynia order, belonging to the hexandria class of plants, and ranking in the second natural order, *Piperitæ*. The characters are: The *calyx* is a cylindric simple spadix covered with florets; there is no *spatha*, nor *perianthium*. The *corolla* is composed of six obtuse, concave, loose petals. The *stamina* consist of six thickish filaments, somewhat longer than the corolla; the antheræ are thickish and didymous. The *pistillum* has a gibbous oblong germen the length of the stamina; no stylus; the stigma a prominent point. The *pericarpium* is a short triangular, obtuse, three-celled capsule, attenuated at both ends. The *seeds* are numerous, and of an oblong egg-shape.

There is but one species, the acorus calamus. It grows naturally in shallow standing waters, and is found wild in some parts of Britain. It grows plentifully in rivulets and marshy places about Norwich and other parts of the island, in the canals of Holland, in Switzerland, and in other countries of Europe. The shops have been usually supplied from the Levant with dried roots, which do not appear to be superior to those of other parts. The leaves are sometimes two feet long, narrow, compressed, smooth, and of a bright green, terminating in a point; the root is pretty long, of a whitish, reddish, and partly greenish colour. Among the leaves there arises a single one, thicker and more robust than the rest, furrowed on the surface, and of a paler green. On this grow frequently two spikes of flowers, by many writers called *juli*. These are of a brown colour, having a chequered surface. The root of this plant has a very agreeable flavour, which is greatly improved by drying. It is reckoned carminative and stomachic, having a warm, pungent, bitterish taste; so is frequently used as an ingredient in bitters. It has been complained of, however, as communicating a nauseous flavour to those bitters in which it was infused; and Neumann observes, that its agreeable flavour, as well as its distinguishing taste, resides entirely in a volatile essential oil; the residuum after distillation having a nauseous flavour, not at all resembling that of the calamus. It is an ingredient in the mithridate and theriaca of the London pharmacopœia; and in the aromatic and stomachic tinctures, and compound arum powder, of the Edinburgh. The fresh root candied is said to be employed at Constantinople as a preservative against epedemic diseases. The leaves of this plant have a sweet fragrant smell, more agreeable, though weaker than that of the roots. Neither horses, cows, goats, sheep, nor swine, will eat the herb, or its root.

Culture. The acorus being a perennial plant, may be transplanted into a garden, where it will thrive very well if the ground is moist; but never flowers unless it grows in water. It loves an open situation, and will not thrive well under the shade of trees. The flowers appear the latter end of June, and continue till August.

ACORUS, in the materia medica, a name sometimes given to the great galangal. See KEMPFERIA.

ACORUS, in natural history, blue coral. The true sort is very scarce; some, however, is fished on the coasts of Africa, particularly from Rio del Re to the river of the Camarones. This coral is part of the merchandise which the Dutch trade for with the Camarones: that of the kingdom of Benin is also very much esteemed. It grows in form of a tree on a rocky bottom.

ACOUSMATICI, sometimes also called *Acoustici*, in Grecian antiquity, such of the disciples of Pythagoras as had not completed their five years probation.

ACOUSTIC, in general, denotes any thing that relates to the ear, the sense of hearing, or the doctrine of sounds.

ACOUSTIC *Duct*, in anatomy, the same with meatus auditorius, or the external passage of the ear. See ANATOMY.

ACOUSTIC *Instrument*, or auricular tube. See ACOUSTICS, n° 26.

ACOUSTIC *Vessels*, in the ancient theatres, were a kind of vessels made of brass, shaped in the bell fashion, which being of all tones within the pitch of the voice or even of instruments, rendered the sounds more audible, so that the actors could be heard through all parts of theatres, which were even 400 feet in diameter.

ACOUSTIC *Disciples*, among the ancient Pythagoreans, those more commonly called ACOUSMATICI.

The SCIENCE of

ACOUSTICS

A C O U S T I C S

1 Diacoustics 2 Catacoustics.

INSTRUCTS us in the nature of found. It is divided by fome writers into *Diacouftics*, which explains the properties of thofe founds that come directly from the fonorous body to the ear; and *Catacouftics*, which treats of reflected founds: but fuch diftinction does not appear to be of any real utility.

CHAP. I. *Different theories of Sound.*

3 Of the vehicles of found.

Moft founds, we all know, are conveyed to us on the bofom of the air. In whatever manner they either float upon it, or are propelled forward in it, certain it is, that, without the vehicle of this or fome other fluid, we fhould have no founds at all. Let the air be exhaufted from a receiver, and a bell fhall emit no found when rung in the void; for, as the air continues to grow lefs denfe, the found dies away in proportion, fo that at laft its ftrongeft vibrations are almoft totally filent.

4 Air not the only one.

Thus air is a vehicle for found. However, we muft not, with fome philofophers, affert, that it is the only vehicle; that, if there were no air, we fhould have no founds whatfoever: for it is found by trial, that founds are conveyed through water almoft with the fame facility with which they move through air. A bell rung in water returns a tone as diftinct as if rung in air. This was obferved by Derham, who alfo remarked that the tone came a quarter deeper. Some naturalifts affure us alfo, that fifhes have a ftrong perception of founds, even at the bottom of deep rivers (A). From hence, it would feem to be not very material in the propagation of founds, whether the fluid which conveys them be elaftic or otherwife. Water, which, of all fubftances that we know, has the leaft elafticity, yet ferves to carry them forward; and if we make allowance for the difference of its denfity, perhaps the founds move in it with a proportional rapidity to what they are found to do in the elaftic fluid of air.

One thing however is certain, that whether the fluid which conveys the note be elaftic or non-elaftic, whatever found we hear is produced by a ftroke, which the founding body makes againft the fluid, whether air or water. The fluid being ftruck upon, carries the impreffion forward to the ear, and there produces its fenfation. Philofophers are fo far agreed, that they all allow that found is nothing more than the impreffion made by an elaftic body upon the air or water (B), and this impreffion carried along by either fluid to the organ of hearing. But the manner in which this conveyance is made, is ftill difputed: Whether the found is diffufed into the air, in circle beyond circle, like the waves of water when we difturb the fmoothnefs of its furface by dropping in a ftone; or whether it travels along, like rays diffufed from a centre, fomewhat in the fwift manner that electricity runs along a rod of iron; thefe are the queftions which have divided the learned.

5 What found is, and how propagated.

6 Newton's theory.

Newton was of the firft opinion. He has explained the progreffion of found by an undulatory, or rather a vermicular, motion in the parts of the air. If we have an exact idea of the crawling of fome infects, we fhall have a tolerable notion of the progreffion of found upon this hypothefis. The infect, for inftance, in its motion, firft carries its contractions from the hinder part, in order to throw its fore-part to the proper diftance; then it carries its contractions from the fore-part to the hinder to bring that forward. Something fimilar to this is

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(A) Dr Hunter has proved this, and demonftrated the auricular organ in thefe animals. See FISH, and COMPARATIVE *Anatomy*.

(B) Though air and water are both vehicles of found, yet neither of them feems to be fo by itfelf, but only as it contains an exceedingly fubtile fluid capable of penetrating the moft folid bodies. Hence, by the medium of that fluid, founds can be propagated through wood, or metals, even more readily than through the open air. By the fame means, deaf people may be made fenfible of founds, if they hold a piece of metal in their mouth, one end of which is applied to the founding body. As it is certain, therefore, that air cannot penetrate metals, we muft acknowledge the medium of found to be of a more fubtile nature; and thus the electrical fluid will naturally occur as the proper one. But why then is found no longer heard in an exhaufted receiver, if the air is not the fluid by which it is conveyed, feeing the electrical matter cannot be excluded? The reply to this is obvious: The electrical fluid is fo exceedingly fubtile, and pervades folid bodies with fo much eafe, that any motion of a folid body in a quantity of electric matter by itfelf, can never excite a degree of agitation in it fufficient for producing a found.; but if the electric fluid is entangled among the particles of air, water, wood, metal, &c. whatever affects their particles will alfo affect this fluid, and produce an audible noife. In the experiment of the air-pump, however, there may be an ambiguity, as the gradual exhaufting of the air creates an increafing difference of preffure on the outfide, and may occafion in the glafs a difficulty of vibrating, fo as to to render it lefs fit to communicate to the air without the vibrations that ftrike it from within. From this caufe the diminution of found in an exhaufted receiver may be fuppofed to proceed, as well as from the diminution of the air. But if any internal agitation of its parts fhould happen to the electrical fluid, exceeding loud noifes might be propagated through it, as has been the cafe when large meteors have kindled at a great diftance from the earth. It is alfo difficult to account for the exceeding great fwiftnefs of found, upon the fuppofition that it is propagated by means of air alone; for nothing is more certain, than that the ftrongeft and moft violent gale is, in its courfe, inert and fluggifh, compared with the motion of found.

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Plate I. fig. 1.

in the motion of the air when ſtruck upon by a ſounding body. To be a little more preciſe, ſuppoſe ABC, the ſtring of an harpſichord ſcrewed to a proper pitch, and drawn out of the right line by the finger at B. We ſhall have occaſion elſewhere to obſerve, that ſuch a ſtring would, if let go, vibrate to E; and from E to D, and back again; that it would continue thus to vibrate like a pendulum for ever, if not externally reſiſted, and like a pendulum, all its little vibrations would be performed in equal times, the laſt and the firſt being equally long in performing; alſo, that, like a pendulum, its greateſt ſwiftneſs would always be when it arrived at E, the middle part of its motion. Now then, if this ſtring be ſuppoſed to fly from the finger at B, it is obvious, that whatever be its own motion, ſuch alſo will be the motion of the parts of air that fly before it. Its motion, as is obvious, is firſt uniformly accelerated forward from B to E, then retarded as it goes from E to D, accelerated back again as it returns from D to E, and retarded from E to B. This motion being therefore ſent in ſucceſſion through a range of elaſtic air, it muſt happen, that the parts of one range of air muſt be ſent forward with accelerated motion, and then with a retarded motion. This accelerated motion reaching the remoteſt end of the firſt range will be communicated to a ſecond range, while the neareſt parts of the firſt range being retarded in their motion, and falling back with the receſſion of the ſtring, retire firſt with an accelerated, then with a retarded motion, and the remoteſt parts will ſoon follow. In the mean time, while the parts of the firſt range are thus falling back, the parts of the ſecond range are going forward with an accelerated motion. Thus there will be an alternate condenſation and relaxation of the air, during the time of one vibration; and as the air going forward ſtrikes any oppoſing body with greater force than upon retiring, ſo each of theſe accelerated progreſſions have been called by Newton a *pulſe* of ſound.

Thus will the air be driven forward in the direction of the ſtring. But now we muſt obſerve, that theſe pulſes will move every way; for all motion impreſſed upon fluids in any direction whatſoever, operates all around in a ſphere: ſo that ſounds will be driven in all directions, backwards, forwards, upwards, downwards, and on every ſide. They will go on ſucceeding each other, one on the outſide of the other, like circles in diſturbed water; or rather, they will lie one without the other, in concentric ſhells, ſhell above ſhell, as we ſee in the coats of an onion.

All who have remarked the tone of a bell, while its ſounds are decaying away, muſt have an idea of the pulſes of ſound, which, according to Newton, are formed by the air's alternate progreſſion and receſſion. And it muſt be obſerved, that as each of theſe pulſes is formed by a ſingle vibration of the ſtring, they muſt be equal to each other; for the vibrations of the ſtring are known to be ſo.

Again, as to the velocity with which ſounds travel, this Newton determines, by the moſt difficult calculation that can be imagined, to be in proportion to the thickneſs of the parts of the air, and the diſtance of theſe parts from each other. From hence he goes on to prove, that each little part moves backward and forward like a pendulum; and from thence he proceeds to demonſtrate, that if the atmoſphere were of the ſame denſity every where as at the ſurface of the earth, in ſuch a caſe, a pendulum, that reached from its higheſt ſurface down to the ſurface of the earth, would by its vibrations diſcover to us the proportion of its velocity with which ſounds travel. The velocity with which each pulſe would move, he ſhows, would be as much greater than the velocity of ſuch a pendulum ſwinging with one complete vibration, as the circumference of a circle is greater than the diameter. From hence he calculates, that the motion of ſound will be 979 feet in one ſecond. But this not being conſonant to experience, he takes in another conſideration, which deſtroys entirely the vigour of his former demonſtration, namely, vapours in the air; and then finds the motion of ſound to be 1142 feet in one ſecond, or near 13 miles in a minute: a proportion which experience had eſtabliſhed nearly before.

Thus much will ſerve to give an obſcure idea of a theory which has met with numbers of oppoſers. Even John Bernouilli, Newton's greateſt diſciple, modeſtly owns that he did not pretend to underſtand this part of the *Principia*. He attempted therefore to give a more perſpicuous demonſtration of his own, that might confirm and illuſtrate the Newtonian theory. The ſubject ſeemed to reject elucidation: his theory is obviouſly wrong, as D'Alembert has proved in his Theory of Fluids. 7 Preceding Theory oppoſed.

Various have been the objections that have been made to the Newtonian ſyſtem of ſounds. It is urged, that this theory can only agree with the motion of ſound in an elaſtic fluid, whereas ſounds are known to move forward through water that is not elaſtic. To explain their progreſs therefore through water, a ſecond theory muſt be formed: ſo that two theories muſt be made to explain a ſimilar effect; which is contrary to the ſimplicity of true philoſophy, for it is contrary to the ſimplicity of nature. It is farther urged, that this ſlow vermicular motion but ill repreſents the velocity with which ſounds travel, as we know by experience that it is almoſt 13 miles in a minute. In ſhort, it is urged, that ſuch undulations as have been deſcribed, when coming from ſeveral ſonorous bodies at once, would croſs, obſtruct, and confound each other; ſo that, if they were conveyed to the ear by this means, we ſhould hear nothing but a medley of diſcord and broken articulations. But this is equally with the reſt contradictory to experience, ſince we hear the fulleſt concert, not only without confuſion, but with the higheſt pleaſure. Theſe objections, whether well founded or not, have given riſe to another theory: which we ſhall likewiſe lay before the reader; though it too appears liable to objections, which ſhall be afterwards mentioned. 8 The objections.

Every ſound may be conſidered as driven off from the ſounding body in ſtraight lines, and impreſſed upon the air in one direction only: but whatever impreſſion is made upon a fluid in one direction, is diffuſed upon its ſurface into all directions; ſo that the ſound firſt driven directly forward ſoon fills up a wide ſphere, and is heard on every ſide. Thus, as it is impreſſed, it inſtantaneouſly travels forward with a very ſwift motion, reſembling the velocity with which we know electricity flies from one end of a line to another. 9 Another Theory.

Now, as to the pulſes, or cloſe ſhakes, as the muſicians expreſs it, which a ſounding body is known to make

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make, each pulse (say the supporters of this theory,) is itself a distinct and perfect sound and the interval between every two pulses is profoundly silent. Continuity of sound from the same body is only a deception of the hearing; for as each distinct sound succeeds at very small intervals, the organ has no time to transmit its images with equal swiftness to the mind, and the interval is thus lost to sense; just as in seeing a flaming torch, if flared round in a circle, it appears as a ring of fire. In this manner a beaten drum, at some small distance, presents us with the idea of continuing sound. When children run with their sticks along a rail, a continuing sound is thus represented, though it need scarce be observed that the stroke against each rail is perfectly distinct and insulated.

According to this theory, therefore, the pulses are nothing more than distinct sounds repeated by the same body, the first stroke or vibration being ever the loudest, and travelling farther than those that follow; while each succeeding vibration gives a new sound, but with diminished force, till at last the pulses decay away totally, as the force decays that gives them existence.

All bodies whatsoever that are struck return more or less a sound: but some, wanting elasticity, give back no repetition of the sound; the noise is at once begotten and dies: while other bodies, however, there are, which being more elastic and capable of vibration, give back a sound, and repeat the same several times successively. These last are said to have a tone; the others are not allowed to have any.

This tone of the elastic string, or bell, is notwithstanding nothing more than a similar sound to what the former bodies produced, but with the difference of being many times repeated while their note is but single. So that, if we would give the former bodies a tone, it will be necessary to make them repeat their sound, by repeating our blows swiftly upon them. This will effectually give them a tone; and even an unmusical instrument has often had a fine effect by its tone in our concerts.

Let us now go on then to suppose, that by swift and equably continued strokes we give any non-elastic body its tone: it is very obvious, that no alterations will be made in this tone by the quickness of the strokes, though repeated ever so fast. These will only render the tone more equal and continuous, but make no alteration in the tone it gives. On the contrary, if we make an alteration in the force of each blow, a different tone will then undoubtedly be excited. The difference will be small, it must be confessed; for the tones of these inflexible bodies are capable but of small variation; however, there will certainly be a difference. The table on which we write, for instance, will return a different sound when struck with a club, from what it did when struck only with a switch. Thus non-elastic bodies return a difference of tone, not in proportion to the swiftness with which their sound is repeated, but in proportion to the greatness of the blow which produced it; for in two equal non-elastic bodies, the body produced the deepest tone which was struck by the greatest blow.

We now then come to a critical question. What is it that produces the difference of tone in two elastic sounding bells or strings? Or what makes one deep and the other shrill? This question has always been hitherto answered by saying, that the depth or height of the note proceeded from the slowness or swiftness of the times of the vibrations. The slowest vibrations, it has been said, are qualified for producing the deepest tones, while the swiftest vibrations produce the highest tones. In this case, an effect has been given for a cause. It is in fact the force with which the sounding string strikes the air when struck upon, that makes the true distinction in the tones of sounds. It is this force, with greater or less impressions, resembling the greater or less force of the blows upon a non-elastic body, which produces correspondent affections of sound. The greatest forces produce the deepest sounds: the high notes are the effect of small efforts. In the same manner a bell, wide at the mouth, gives a grave sound; but if it be very massy withal, that will render it still graver; but if massy, wide, and long or high, that will make the tone deepest of all.

Thus, then, will elastic bodies give the deepest sound, in proportion to the force with which they strike the air: but if we should attempt to increase their force by giving them a stronger blow, this will be in vain; they will still return the same tone; for such is their formation, that they are sonorous only because they are elastic, and the force of this elasticity is not increased by our strength as the greatness of a pendulum's vibration will not be increased by falling from a greater height.

Thus far of the length of chords. Now as to the frequency with which they vibrate the deepest tones, it has been found, from the nature of elastic strings, that the longest strings have the widest vibrations, and consequently go backward and forward slowest; while, on the contrary, the shortest strings vibrate the quickest, or come and go in the shortest intervals. From hence those who have treated of sounds, have asserted, as was said before, that the tone of the string depended upon the length or the shortness of the vibrations. This, however, is not the case. One and the same string, when struck, must always, like the same pendulum, return precisely similar vibrations; but it is well known, that one and the same string, when struck upon, does not always return precisely the same tone: so that in this case the vibrations follow one rule, and the tone another. The vibrations must be invariably the same in the same string, which does not return the same tone invariably, as is well known to musicians in general. In the violin, for instance, they can easily alter the tone of the string an octave or eight notes higher, by a softer method of drawing the bow; and some are known thus to bring out the most charming airs imaginable. These peculiar tones are by the English fiddlers called *flute-notes*. The only reason, it has been alleged, that can be assigned for the same string thus returning different tones, must certainly be the different force of its strokes upon the air. In one case, it has double the tone of the other; because upon the soft touches of the bow, only half its elasticity is put into vibration.

This being understood (continue the authors of this theory), we shall be able clearly to account for many things relating to sounds that have hitherto been inexplicable. Thus, for instance, if it be asked, When two strings are stretched together of equal lengths, tensions, and thickness, how does it happen, that one of them being struck, and made to vibrate throughout,

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throughout, the other ſhall vibrate throughout alſo? the anſwer is obvious: The force that the ſtring ſtruck receives is communicated to the air, and the air communicates the ſame to the ſimilar ſtring; which therefore receives all the force of the former; and the force being equal, the vibrations muſt be ſo too. Again, put the queſtion, If one ſtring be but half the length of the other, and be ſtruck, how will the vibrations be? The anſwer is, The longeſt ſtring will receive all the force of the ſtring half as long as itſelf, and therefore it will vibrate in proportion, that is, through half its length. In the ſame manner, if the longeſt ſtring were three times as long as the other, it would only vibrate in a third of its length; or if four times, in a fourth of its length. In ſhort, whatever force the ſmaller ſtring impreſſes upon the air, the air will impreſs a ſimilar force upon the longer ſtring, and partially excite its vibrations.

10 Eolian Lyre. See Plate I. fig. 2.

From hence alſo we may account for the cauſe of thoſe charming, melancholy gradations of ſound in the Eolian lyre; an inſtrument (ſays Sir John Hawkins) lately obtruded upon the public as a new invention, though deſcribed above a century ago by Kircher *. This inſtrument is eaſily made, being nothing more than a long narrow box of thin dale, about 30 inches long, 5 inches broad, and $1\frac{3}{4}$ inches deep, with a circle in the middle of the upper ſide or belly about $1\frac{1}{2}$ inch diameter, pierced with ſmall holes. On this ſide are ſeven, ten, or (according to Kircher) fifteen or more ſtrings of very fine gut, ſtretched over bridges at each end, like the bridge of a fiddle, and ſcrewed up or relaxed with ſcrew-pins (B). The ſtrings are all tuned to one and the ſame note; and the inſtrument is placed in ſome current of air, where the wind can bruſh over its ſtrings with freedom. A window with the ſaſh juſt raiſed to give the air admiſſion, will anſwer this purpoſe exactly. Now when the entering air blows upon theſe ſtrings with different degrees of force, there will be excited different tones of ſound; ſometimes the blaſt brings out all the tones in full concert; ſometimes it ſinks them to the ſofteſt murmurs; it feels for every tone, and by its gradations of ſtrength ſolicits thoſe gradations of ſound which art has taken different methods to produce.

* *Vide* Kircheri Muſurgia. lib. ix.

It remains, in the laſt place, to conſider (by this theory) the loudneſs and lowneſs, or, as the muſicians ſpeak, the ſtrength and ſoftneſs of ſound. In vibrating elaſtic ſtrings, the loudneſs of the tone is in proportion to the deepneſs of the note; that is, in two ſtrings, all things in other circumſtances alike, the deepeſt tone will be loudeſt. In muſical inſtruments upon a different principle, as in the violin, it is otherwiſe; the tones are made in ſuch inſtruments, by a number of ſmall vibrations crowded into one ſtroke. The roſined bow, for inſtance, being drawn along a ſtring, its roughneſſes catch the ſtring at very ſmall intervals, and excite its vibrations. In this inſtrument, therefore, to excite loud tones, the bow muſt be drawn quick, and this will produce the greateſt number of vibrations. But it muſt be obſerved, that the more quick the bow paſſes over the ſtring, the leſs apt will the roughneſs of its ſurface be to touch the ſtring at every inſtant; to remedy this, therefore, the bow muſt be preſſed the harder as it is drawn quicker, and thus its fulleſt ſound will be brought from the inſtrument. If the ſwiftneſs of the vibrations in an inſtrument thus rubbed upon, exceed the force of the deeper ſound in another, then the ſwift vibrations will be heard at a greater diſtance, and as much farther off as the ſwiftneſs in them exceeds the force in the other.

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11 The nature of Muſical Sounds illuſtrated according to the ſame theory.

By the ſame theory (it is alleged) may all the phenomena of muſical ſounds be eaſily explained.—The fables of the ancients pretend, that muſic was firſt found out by the beating of different hammers upon the ſmith's anvil. Without purſuing the fable, let us endeavour to explain the nature of muſical ſounds by a ſimilar method. Let us ſuppoſe an anvil, or ſeveral ſimilar anvils, to be ſtruck upon by ſeveral hammers of different weights or forces. The hammer, which is double that of another, upon ſtriking the anvil will produce a ſound double that of the other: this double ſound muſicians have agreed to call an Octave. The ear can judge of the difference or reſemblance of theſe ſounds with great eaſe, the numbers being as one and two, and therefore, very readily compared. Suppoſe that an hammer, three times leſs than the firſt, ſtrikes the anvil, the ſound produced by this will be three times leſs than the firſt: ſo that the ear, in judging the ſimilitude of theſe ſounds, will find ſomewhat more difficulty; becauſe it is not ſo eaſy to tell how often one is contained in three, as it is to tell how often it is contained in two. Again, ſuppoſe that an hammer four times leſs than the firſt ſtrikes the anvil, the ear will find greater difficulty ſtill in judging preciſely the difference of the ſounds; for the difference of the numbers four and one cannot ſo ſoon be determined with preciſion as three and one. If the hammer be five times leſs, the difficulty of judging will be ſtill greater. If the hammer be ſix times leſs, the difficulty ſtill increaſes, and ſo alſo of the ſeventh, inſomuch that the ear cannot always readily and at once determine the preciſe gradation. Now, of all compariſons, thoſe which the mind makes moſt eaſily, and with leaſt labour, are the moſt pleaſing. There is a certain regularity in the human ſoul, by which it finds happineſs in exact and ſtriking, and eaſily-made compariſons. As the ear is but an inſtrument of the mind, it is therefore moſt pleaſed with the combination of any two ſounds, the differences of which it can moſt readily diſtinguiſh. It is more pleaſed with the concord of two ſounds which are to each other as one and two, than of two ſounds which are as one and three, or one and four, or one and five, or one and ſix or ſeven. Upon this pleaſure, which the mind takes in compariſon, all harmony depends. The variety of ſounds is infinite; but becauſe the ear cannot compare two ſounds ſo as readily to diſtinguiſh their diſcriminations when they exceed the proportion of one and ſeven, muſicians have been content to confine all harmony within that compaſs, and allowed but ſeven notes in muſical compoſition.

Let us now then ſuppoſe a ſtringed inſtrument fitted up

(B) The figure repreſents the inſtrument with ten chords; of which ſome direct only eight to be tuned uniſons, and the two outermoſt octaves below them. But this ſeems not to be material.

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up in the order mentioned above. For instance: Let the first string be twice as long as the second; let the third string be three times shorter than the first; let the fourth be four times, the fifth string five times, and the sixth six times as short as the first. Such an instrument would probably give us a representation of the lyre as it came first from the hand of the inventor. This instrument will give us all the seven notes following each other, in the order in which any two of them will accord together most pleasingly; but yet it will be a very inconvenient and a very disagreeable instrument: inconvenient, for in a compass of seven strings only, the first must be seven times as long as the last; and disagreeable, because this first string will be seven times as loud also; so that when the tones are to be played in a different order, loud and soft sounds would be intermixed with most disgusting alternations. In order to improve the first instrument, therefore, succeeding musicians very judiciously threw in all the other strings between the two first, or, in other words, between the two Octaves, giving to each, however, the same proportion to what it would have had in the first natural instrument. This made the instrument more portable, and the sounds more even and pleasing. They therefore disposed the sounds between the Octave in their natural order, and gave each its own proportional dimensions. Of these sounds, where the proportion between any two of them is most obvious, the concord between them will be most pleasing. Thus Octaves, which are as two to one, have a most harmonious effect; the fourth and fifth also sound sweetly together, and they will be found, upon calculation, to bear the same proportion to each other that Octaves do. "Let it "not be supposed (says Mr Saveur), that the musical "scale is merely an arbitrary combination of sounds; "it is made up from the consonance and differences of "the parts which compose it. Those who have often "heard a fourth and fifth accord together, will be "naturally led to discover their difference at once; and "the mind unites itself to their beauties." Let us then cease to assign the coincidences of vibrations as the cause of harmony, since these coincidences in two strings vibrating at different intervals, must at best be but fortuitous; whereas concord is always pleasing. The true cause why concord is pleasing, must arise from our power, in such a case, of measuring more easily the differences of the tones. In proportion as the note can be measured with its fundamental tone by large and obvious distinctions, then the concord is most pleasing; on the contrary, when the ear measures the discriminations of two tones by very small parts, or cannot measure them at all, it loses the beauty of their resemblance; the whole is discord and pain (c).

But there is another property in the vibration of a musical string not yet taken notice of, and which is alleged to confirm the foregoing theory. If we strike the string of an harpsichord, or any other elastic sounding chord whatever, it returns a continuing sound. This till of late was considered as one simple uniform tone; but all musicians now confess, that instead of one tone it actually returns four tones, and that constantly. The notes are, beside the fundamental tone, an octave above, a twelfth above, and a seventeenth. One of the bass-notes of an harpsichord has been dissected in this manner by Rameau, and the actual existence of these tones proved beyond a possibility of being controverted. In fact, the experiment is easily tried; for if we smartly strike one of the lower keys of an harpsichord, and then take the finger briskly away, a tolerable ear will be able to distinguish, that, after the fundamental tone has ceased, three other shriller tones will be distinctly heard; first the octave above, then the twelfth, and lastly the seventeenth: the octave above is in general almost mixed with the fundamental tone, so as not to be easily perceived, except by an ear long habituated to the minute discrimination of sounds. So that we may observe, that the smallest tone is heard last, and the deepest and largest one first: the two others in order.

In the whole theory of sounds, nothing has given greater room for speculation, conjecture, and disappointment, than this amazing property in elastic strings. The whole string is universally acknowledged to be in vibration in all its parts, yet this single vibration returns no less than four different sounds. They who account for the tones of strings by the number of their vibrations, are here at the greatest loss. Daniel Bernouilli supposes, that a vibrating string divides itself into a number of curves, each of which has a peculiar vibration; and though they all swing together in the common vibration, yet each vibrates within itself. This opinion, which was supported, as most geometrical speculations are, with the parade of demonstration, was only born soon after to die. Others have ascribed this to an elastic difference in the parts of the air, each of which, at different intervals, thus received different impressions from the string, in proportion to their elasticity. This is absurd. If we allow the difference of tone to proceed from the force, and not the frequency, of the vibrations, this difficulty will admit of an easy solution. These sounds, though they seem to exist together in the string, actually follow each other in succession: while the vibration has greater force, the fundamental tone is brought forward: the force of the vibration decaying, the octave is produced, but almost only instantaneously; to this succeeds, with diminished force, the twelfth; and, lastly, the seventeenth is heard to vibrate with great distinctness, while the three other tones are always silent. These sounds, thus excited, are all of them the harmonic tones, whose differences from the fundamental tone are, as was said, strong, and distinct. On the other hand, the discordant tones cannot be heard. Their differences being but very small, they are overpowered, and in a manner drowned in the tones of superior difference: yet not always neither; for Daniel Bernouilli has been able, from the same stroke, to make the same string bring out its harmonic and its discordant tones also (D.) So that from hence we may justly infer, that every note whatsoever

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(c) It is certain, that in proportion to the simplicity of relations in sound, the ear is pleased with its combinations; but this is not to be admitted as the cause why musicians have confined all harmony to an octave. Discriminated sounds, whose vibrations either never coincide, or at least very rarely, do not only cease to please, but violently grate the ear. Harmony and discord, therefore, are neither discriminated by the judgment of hearers, nor the institution of musicians, but by their own essential and immutable nature.

(D) Vid. Memoires de l' Academie de Berlin, 1753, p. 153.

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is only a succession of tones; and that those are most distinctly heard, whose differences are most easily perceivable.

12 Objections to the preceding theory.

To this theory, however, though it has a plausible appearance, there are strong and indeed insuperable objections. The very fundamental principle of it is false. No body whatever, whether elastic or non-elastic, yields a graver sound by being struck with a larger instument, unless either the sounding body, or that part of it which emits the sound, is enlarged. In this case, the largest bodies always return the gravest sounds.

In speaking of elastic and non-elastic bodies in a musical sense, we are not to push the distinction so far as when we speak of them philosophically. A body is *musically* elastic, all of whose parts are thrown into vibrations so as to emit a sound when only part of their surface is struck. Of this kind are bells, musical strings, and all bodies whatever that are considerably hollow. —Musical non-elastics are such bodies as emit a sound only from that particular place which is struck: thus, a table, a plate of iron nailed on wood, a bell sunk in the earth, are all of them non-elastics in a musical sense, though not philosophically so. When a solid body, such as a log of wood, is struck with a switch, only that part of it emits a sound which comes in contact with the switch; the note is acute and loud, but would be no less so though the adjacent parts of the log were removed. If, instead of the switch, a heavier or larger instrument is made use of, a larger portion of its surface then returns a sound, and the note is consequently more grave; but it would not be so, if the large instrument struck with a sharp edge, or a surface only equal to that of a small one.

In sounds of this kind, where there is only a single thwack, without any repetition, the immediate cause of the gravity or acuteness seems to be the quantity of air displaced by the sounding body; a large quantity of air displaced, produces a grave sound, and a smaller quantity a more acute one, the force wherewith the air is displaced signifying very little.—What we here advance is confirmed by some experiments made by Dr Priestley, concerning the *musical tone* of electrical discharges. The passage being curious, and not very long, we shall here transcribe it:

"As the course of my experiments has required a great variety of electrical explosions, I could not help observing a great variety in the musical tone made by the reports. This excited my curiosity to attempt to reduce this variation to some measure. Accordingly, by the help of a couple of spinets, and two persons who had good ears for music, I endeavoured to ascertain the tone of some electrical discharges; and observed, that every discharge made several strings, particularly those that were chords to one another, to vibrate: but one note was always predominant, and sounded after the rest. As every explosion was repeated several times, and three of us separately took the same note, there remained no doubt but that the tone we fixed upon was at least very near the true one. The result was as follows:

"A jar containing half a square foot of coated glass sounded F sharp, concert pitch. Another jar of a different form, but equal surface, sounded the same.

"A jar of three square feet sounded C below F sharp. A battery consisting of sixty-four jars, each containing half a square foot, sounded F below the C.

"The same battery, in conjunction with another of thirty-one jars, sounded C sharp. So that a greater quantity of coated glass always gave a deeper note.

"Differences in the degree of a charge in the same jar made little or no difference in the tone of the explosion: if any, a higher charge gave rather a deeper note."

These experiments show us how much the gravity or acuteness of sounds depend on the quantity of air put in agitation by the sounding body. We know that the noise of the electric explosion arises from the return of the air into the vacuum produced by the electric flash. The larger the vacuum, the deeper was the note: for the same reason, the discharge of a musket produces a more acute note than that of a cannon; and thunder is deeper than either.

Besides this, however, other circumstances concur to produce different degrees of gravity or acuteness in sounds. The sound of a table struck upon with a piece of wood, will not be the same with that produced from a plate of iron struck by the same piece of wood, even if the blows should be exactly equal, and the iron perfectly kept from vibrating.—Here the sounds are generally said to differ in their degrees of acuteness, according to the specific gravities or densities of the substances which emit them. Thus gold, which is the most dense of all metals, returns a much graver sound than silver; and metalline wires, which are more dense than therms, return a proportionably greater sound.—But neither does this appear to be a general rule in which we can put confidence. Bell-metal is denser than copper, but it by no means appears to yield a graver sound; on the contrary, it seems very probable, that copper will give a graver sound than bell-metal, if both are struck upon in their non-elastic state; and we can by no means think that a bell of pure tin, the least dense of all the metals, will give a more acute sound than one of bell-metal, which is greatly more dense.—In some bodies hardness seems to have a considerable effect. Glass, which is considerably harder than any metal, gives a more acute sound; bell-metal is harder than gold, lead, or tin; and therefore sounds much more acutely; though how far this holds with regard to different substances, there are not a sufficient number of experiments for us to judge.

In bodies musically elastic, the whole substance vibrates with the slightest stroke, and therefore they always give the same note whether they are struck with a large or with a small instrument; so that striking a part of the surface of any body musically elastic is equivalent, in it, to striking the whole surface of a non-elastic one. If the whole surface of a table was struck with another table, the note produced would be neither more or less acute whatever force was employed; because the whole surface would then yield a sound, and no force could increase the surface: the sound would indeed be louder in proportion to the force employed, but the gravity would remain the same. In like manner, when a bell, or musical string, is struck, the whole substance vibrates, and a greater stroke cannot increase the substance.—Hence we see the fallacy of what is said concerning the Pythagorean anvils. An anvil is a body musically elastic, and no difference in the tone can

can be perceived whether it is ſtruck with a large, or with a ſmall hammer; becauſe either of them are ſufficient to make the whole ſubſtance vibrate, provided nothing but the anvil is ſtruck upon: ſmiths, however, do dot ſtrike their anvils, but red-hod iron laid upon their anvils; and thus the vibrations of the anvil are ſtopped, ſo that it becomes a non-elaſtic body, and the differences of tone in the ſtrokes of different hammers proceed only from the ſurface of the large hammers covering the whole ſurface of the iron, or at leaſt a greater part of it than the ſmall ones. If the ſmall hammer is ſufficient to cover the whole ſurface of the iron as well as the large one, the note produced will be the ſame, whether the large or the ſmall hammer is uſed.

Laſtly, The argument for the preceding theory, grounded on the production of what are called *flute-notes* on the violin, is built on a falſe foundation; for the bow being lightly drawn on an open ſtring, produces no *flute-notes*, but only the harmonies of the note to which the ſtring is tuned. The *flute-notes* are produced by a particular motion of the bow, quick and near the bridge, and by fingering very gently. By this management, the ſame ſounds are produced, tho' at certain intervals only, as if the vibrations were transferred to the ſpace between the end of the finger-board and the finger, inſtead of that between the finger and the bridge. Why this ſmall part of the ſtring ſhould vibrate in ſuch a caſe, and not that which is under the immediate action of the bow, we muſt own ourſelves ignorant: nor dare we affirm that the vibrations really are transferred in this manner, only the ſame ſounds are produced as if they were.

Though theſe objections ſeem ſufficiently to overturn the foregoing theory, with regard to acute ſounds being the effects of weak ſtrokes, and grave ones of ſtronger impulſes, we cannot admit that longer or ſhorter vibrations are the occaſion of gravity or acuteneſs in ſound. A muſical ſound, however lengthened, either by ſtring or bell, is only a repetition of a ſingle one, whoſe duration by itſelf is but for a moment, and is therefore termed *inappretiable*, like the ſmack of a whip, or the exploſion of an electrical battery. The continuation of the ſound is nothing more than a repetition of this inſtantaneous inappretiable noiſe after the manner of an echo, and it is only this echo that makes the ſound agreeable. For this reaſon, muſic is much more agreeable when played in a large hall where the ſound is reverberated, than in a ſmall room where there is no ſuch reverberation. For the ſame reaſon, the ſound of a ſtring is more agreeable when put on a hollow violin than when faſtened to a plain board, &c.—In the ſound of a bell, we cannot avoid obſerving this echo very diſtinctly. The ſound appears to be made up of diſtinct pulſes, or repetitions of the ſame note produced by the ſtroke of the hammer. It can by no means be allowed, that the note would be more acute though theſe pulſes were to ſucceed one another more rapidly; the ſound would indeed become more ſimple, but would ſtill preſerve the ſame tone.—In muſical ſtrings the reverberations are vaſtly more quick than in bells; and therefore their ſound is more uniform or ſimple, and conſequently more agreeable than that of bells. In muſical glaſſes*, the vibrations muſt be inconceivably quicker than in any bell, or ſtringed inſtrument: and hence they are of all others the moſt ſimple and the moſt agreeable, though neither the moſt acute nor the loudeſt.—As far as we can judge, quickneſs of vibration contributes to the uniformity, or ſimplicity, but not to the acuteneſs, nor to the loudneſs of a muſical note.

* See *Harmonics*.

It may here be objected, that each of the different pulſes, of which we obſerve the ſound of a bell to be compoſed, is of a very perceptible length, and far from being inſtantaneous; ſo that it is not fair to infer that the ſound of a bell is only a repetition of a ſingle inſtantaneous ſtroke, ſeeing it is evidently the repetition of a lengthened note.—To this it may be replied, that the inappretiable ſound which is produced by ſtriking a bell in a non-elaſtic ſtate, is the very ſame which, being firſt propagated round the bell, forms one of theſe ſhort pulſes that is afterwards re-echoed as long as the vibrations of the metal continue, and it is impoſſible that the quickneſs of repetition of any ſound can either increaſe or diminiſh its gravity.

Chap. II. *Of the propagation of Sound. Newton's Doctrine explained and vindicated.*

13 Propagation of ſound.

The writers on ſound have been betrayed into theſe difficulties and obſcurities, by rejecting the 47th propoſition, B. ii. of Newton, as inconcluſive reaſoning. Of this propoſition, however, the ingenious Mr Young of Trinity college, Dublin, has lately given a clear, explanatory, and able defence. He candidly owns that the demonſtration is obſcurely ſtated, and takes the liberty of varying, in ſome degree, from the method of Newton.

"1. The parts of all ſounding bodies, (he obſerves), vibrate according to the law of a cycloidal pendulum: for they may be conſidered as compoſed of an indefinite number of elaſtic fibres; but theſe fibres vibrate according to that law. *Vide Helſham, p.* 270.

"2. Sounding bodies propagate their motions on all ſides *in directum*, by ſucceſſive condenſations and rarefactions, and ſucceſſive goings forward and returnings backward of the particles. *Vide prop.* 43. *B.* 2. *Newton.*

"3. The pulſes are thoſe parts of the air which vibrate backwards and forwards; and which, by going forward, ſtrike (*pulſant*) againſt obſtacles. The latitude of pulſe is the rectilineal ſpace through which the motion of the air is propagated during one vibration of the ſounding body.

"All pulſes move equally faſt. This is proved by experiment; and it is found that they deſcribe 1070 Paris feet, or 1142 London feet in a ſecond, whether the ſound be loud or low, grave or acute.

"5. Prob. To determine the latitude of a pulſe. Divide the ſpace which the pulſe deſcribes in a given time (4) by the number of vibrations performed in the ſame time by the ſounding body, (*cor.* 1. *prop.* 24. *Smith's Harmonics*), the quotient is the latitude.

"M. Sauveur, by ſome experiments on organ-pipes, found that a body, which gives the graveſt harmonic ſound, vibrates 12 times and a half in a ſecond, and that the ſhrilleſt ſounding body vibrates 51.100 times in a ſecond. At a medium, let us take the body which gives what Sauveur calls his *fixed ſound*: it performs 100 vibrations in a ſecond, and in the ſame time the pulſes deſcribe 1070 Pariſian feet; therefore the ſpace deſcribed by the pulſes whilſt the body vibrates once, that

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that is, the latitude or interval of the pulse, will be 10.7 feet.

"6. Prob. To find the Proportion which the greatest space, through which the particles of the air vibrate, bears to the radius of a circle, whose perimeter is equal to the latitude of the pulse.

"During the first half of the progress of the elastic fibre, or sounding body, it is continually getting nearer to the next particle; and during the latter half of its progress, that particle is getting farther from the fibre, and these portions of time are equal (*Helsham*): therefore we may conclude, that at the end of the progress of the fibre, the first particle of air will be nearly as far distant from the fibre as when it began to move; and in the same manner we may infer, that all the particles vibrate through spaces nearly equal to that run over by the fibre.

"Now, M. Sauveur (*Acad. Science, an.* 1700, *p.* 141) has found by experiment, that the middle point of a chord which produces his *fixed sound*, and whose diameter is $\frac{1}{6}$th of a line, runs over in its smallest sensible vibrations $\frac{1}{18}$th of a line, and in its greatest vibrations 72 times that space; that is $72+\frac{1}{18}$th of a line, or 4 lines, that is, $\frac{1}{3}$d of an inch.

"The latitude of the pulses of this fixed sound is 10.7 feet (5); and since the circumference of a circle is to its radius as 710 is to 113, the greatest space described by the particles will be to the radius of a circle, whose periphery is equal to the latitude of the pulse as $\frac{1}{3}$d of an inch is to 1.7029 feet, or 20.4348 inches, that is, as 1 to 61.3044.

"If the length of the string be increased or diminished in any proportion, *cæteris paribus*, the greatest space described by its middle point will vary in the same proportion. For the inflecting force is to the tending force as the distance of the string from the middle point of vibration to half the length of the string (*see Helsham and Martin*); and therefore the inflecting and tending forces being given, the string will vibrate through spaces proportional to its length; but the latitude of the pulse is inversely as the number of vibrations performed by the string in a given time, (5) that is, directly as the time of one vibration, or directly as the length of the string (*prop.* 24. *cor.* 7. *Smith's Harmonics*); therefore the greatest space through which the middle point of the string vibrates, will vary in the direct ratio of the latitude of the pulse, or of the radius of a circle whose circumference is equal to the latitude, that is, it will be to that radius as 1 to 61.3044.

"7. If the particles of the aërial pulses, during any part of their vibration, be successively agitated according to the law of a cycloidal pendulum, the comparative elastic forces arising from their mutual action, by which they will afterwards be agitated, will be such as will cause the particles to continue that motion, according to the same law, to the end of their vibration.

Plate I. fig. 7.

"Let AB, BC, CD, &c. denote the equal distances of the successive pulses; ABC the direction of the motion of the pulses propagated from A towards B; E, F, G, three physical points of the quiescent medium, situated in the right line AC at equal distances from each other; E*e*, F*f*, G*g* the very small equal spaces through which these particles vibrate; ϵ, φ, γ any intermediate places of these points. Draw the right line PS equal to E*e*, bisect it in O, and from the centre O with the radius OP describe the circle SIP*h*. Let the whole time of the vibration of a particle and its parts be denoted by the circumference of this circle and its proportional parts. And since the particles are supposed to be at first agitated according to the law of a cycloidal pendulum, if at any time PH, or PHS*h*, the perpendicular HL or *hl*, be let fall on PS, and if E*e* be taken equal to PL or P*l*, the particle E shall be found in ϵ. Thus will the particle E perform its vibrations according to the law of a cycloidal pendulum. *Prop.* 52. *B.* 1. *Principia.*

"Let us suppose now, that the particles have been successively agitated, according to this law, for a certain time, by any cause whatsoever, and let us examine what will be the comparative elastic forces arising from their mutual action, by which they will afterwards continue to be agitated.

"In the circumference PHS*h* take the equal arches HI, IK, in the same ratio to the whole circumference which the equal right lines EF, FG have to BC the whole interval of the pulses; and let fall the perpendiculars HL, IM, KN. Since the points E, F, G are successively agitated in the same manner, and perform their entire vibrations of progress and regress while the pulse is propagated from B to C, if PH be the time from the beginning of the motion of E, PI will be the time from the beginning of the motion of F, and PK the time from the beginning of the motion of G; and therefore Eϵ, Fφ, Gγ will be respectively equal to PL, PM, PN in the progress of the particles. Whence $\epsilon\varphi$ or EF+Fφ—E, is equal to EF—LM. But $\epsilon\varphi$ is the expansion of EF in the place $\epsilon\varphi$, and therefore this expansion is to its mean expansion as EF—LM to EF. But LM is to IH as IM is to OP, and IH is to EF as the circumference PHS*h* is to BC; that is, as OP is to V, if V be the radius of a circle whose circumference is BC; therefore, *ex æquo*, LM is to EF as IM is to V; and therefore the expansion of EF in the place $\epsilon\varphi$ is to its mean expansion as V—IM is to V; and the elastic force existing between the physical points E and F is to the mean elastic force as $\frac{1}{V-IM}$ is to $\frac{1}{V}$ (*Cotes Pneum Lect.* 9.) By the same arguments, the elastic force existing between the physical points F and G is to the mean elastic force as $\frac{1}{V-KN}$ is to $\frac{1}{V}$; and the difference between these forces is to the mean elastic force as

$$\frac{IM-KN}{V^2-V.IM-V.KN+IM.KN} \text{ is to } \frac{1}{V}; \text{ that is, as } \frac{IM-KN}{V^2} \text{ is to } \frac{1}{V};$$

or as IM—KN is to V; if only (upon account of the very narrow limits of the vibration) we suppose IM and KN to be indefinitely less than V. Wherefore, since V is given, the difference of the forces is as IM—KN, or as HL—IM (because KH is bisected in I), that is (because HL—IM is to IH as OM is to OI or OP, and IH and OP are given quantities) as OM; that is, if F*f* be bisected in Ω as $\Omega\varphi$.

"In the same manner it may be shown, that if PHS*h* be the time from the beginning of the motion of E, PHS*i* will be the time from the beginning of the motion of F, and PHS*k* the time from the beginning of the

the motion of G; and that the expanſion of EF in the place $\epsilon\phi$ is to its mean expanſion as $EF+F\phi-E\epsilon$, or as $EF+lm$ is to EF, or as $V+hi$ is to V in its regreſs; and its elaſtic force to the mean elaſtic force as $\frac{1}{V+hi}$ is to $\frac{1}{V}$; and that the difference of the elaſtic forces exiſting between E and F, and between F and G is to the mean elaſtic force as $kn-im$ is to V; that is, directly as $\Omega\phi$.

" But this difference of the elaſtic forces, exiſting between E and F, and between F and G, is the comparative elaſtic force by which the phyſical point ϕ is agitated: and therefore the comparative accelerating force, by which every phyſical point in the medium will continue to be agitated both in progreſs and regreſs, will be directly as its diſtance from the middle point of its vibration; and conſequently, will be ſuch as will cauſe the particles to continue their motion, undiſturbed, according to the law of a cycloidal pendulum. *Prop.* 38. *l.* 1. *Newton.*

" Newton rejects the quantity $+V\times\overline{IM+KN}+IM\times KN$ on ſuppoſition that IM and KN are indefinitely leſs than V. Now, although this may be a reaſonable hypotheſis, yet, that this quantity may be ſafely rejected, will, I think, appear in a more ſatisfactory manner from the following conſiderations derived from experiment: PS, in its greateſt poſſible ſtate, is to V as 1 is to 61.3044 (6); and therefore IM or KN, in its greateſt poſſible ſtate, (that is, when the vibrations of the body are as great as poſſible, and the particle in the middle point of its vibration) is to V as one is to 122 6. Hence $V^2=15030.76$, $-V\times\overline{IM+KN}=245.2$ and $IM\times KN=1$; therefore V^2 is to $V^2-V\times\overline{IM+KN}+\overline{IM\times KN}$ as 15.03076 is to 14.78656; that is, as 61 is to 60 nearly.

" Hence it appears, that the greateſt poſſible error in the accelerating force, in the middle point, is the $\frac{1}{61}$ſt part of the whole. In other points it is much leſs; and in the extreme points the error entirely vaniſhes.

" We ſhould alſo obſerve, that the ordinary ſounds we hear are not produced by the greateſt poſſible vibration of which the ſounding body is capable; and that in general IM and KN are nearly evaneſcent with reſpect to V. And very probably the diſagreeable ſenſations we feel in very loud ſounds, ariſe not only from IM or KN bearing a ſenſible proportion to V, by which means the cycloidal law of the pulſes may be in ſome meaſure diſturbed, but alſo from the very law of the motion of the ſounding body itſelf being diſturbed. For, the proof of this law's being obſerved by an elaſtic fibre is founded on the hypotheſis that the ſpace, through which it vibrates, is indefinitely little with reſpect to the length of the ſtring. *See Smith's Harmonics. p.* 237, *Helſham, p.* 270.

" 8. If a particle of the medium be agitated, according to the law of a cycloidal pendulum, the comparative elaſtic force, acting on the adjacent particle, from the inſtant in which it begins to move, will be ſuch as will cauſe it to continue its motion according to the ſame law.

" For let us ſuppoſe, that three particles of the medium had continued to move for times denoted by the arches PK, PI, PH, the comparative elaſtic force, acting on the ſecond during the time of its motion, would have been denoted by HL—IM, that is, would have been directly at MO (7). And if this time be diminiſhed till I becomes coincident with P, that is, if you take the particles in that ſtate when the ſecond is juſt beginning to move, and before the third particle has yet been ſet in motion; then the point M will fall on P, and MO become PO; that is, the comparative elaſtic force of the ſecond particle, at the inſtant in which it begins to move, will be the force with which it is agitated in any other moment of time, before the ſubſequent particle has yet been ſet in motion, directly as its diſtance from the middle point of vibration. Now this comparative elaſtic force, with which the ſecond particle is agitated in the very moment in which it begins to move, ariſes from the preceding particle's approaching it according to the law of a pendulum; and therefore, if the preceding particle approaches it in this manner, the force by which it will be agitated, in the very moment it begins to move, will be exactly ſuch as ſhould take place in order to move it according to the law of a pendulum. It therefore ſets out according to that law, and conſequently the ſubſequent elaſtic forces, generated in every ſucceſſive moment, will alſo continue to be of the juſt magnitude which ſhould take place, in order to produce ſuch a motion.

" 9. The pulſes of the air are propagated from ſounding bodies, according to the law of a cycloidal pendulum. The point E of any elaſtic fibre producing a ſound, may be conſidered as a particle of air vibrating according to the law of a pendulum (1). This point E will therefore move according to this law for a certain time, denoted by the arch IH, before the ſecond particle begins to move; for ſound is propagated in time through the ſucceſſive particles of air (4). Now from that inſtant, the comparative elaſtic force which agitates F, is (8) directly as its diſtance from the middle point of vibration. F therefore ſets out with a motion according to the law of a pendulum: and therefore the comparative elaſtic force by which it will be agitated until G begins to move, will continue that law (8). Conſequently F will approach G in the ſame manner as E approached F, and the comparative elaſtic force of G, from the inſtant in which it begins to move, will be directly as its diſtance from the middle point of vibration; and ſo on in ſucceſſion: Therefore all the particles of air in the pulſes ſucceſſively ſet out from their proper places according to the law of a pendulum, and therefore (7) will finiſh their entire vibrations according to the ſame law.

Plate I. fig. 7.

" *Cor.* 1. The number of pulſes propagated is the ſame with the number of vibrations of the tremulous body, nor is it multiplied in their progreſs: becauſe the little phyſical line $\epsilon\gamma$, (*fig.* 7) as ſoon as it returns to its proper place, will there quieſce; for its velocity, which is denoted by the ſine IM, then vaniſhes, and its denſity becomes the ſame with that of the ambient medium. This line, therefore, will no longer move, unleſs it be again driven forwards by the impulſe of the ſounding body, or of the pulſes propagated from it.

" *Cor.* 2. In the extreme points of the little ſpace through which the particle vibrates, the expanſion of the air is in its natural ſtate; for the expanſion of the phyſical line is to its natural expanſion as $V\mp IM$ is to

Propagation of Sound.

to V; but IM is then equal to nothing. In the middle point of the progreſs the condenſation is greateſt; for IM is then greateſt; and conſequently the expanſion V—IM leaſt. In the middle of the regreſs, the rarefaction is greateſt; for *im*, and conſequently V+*im*, is then greateſt.

" 10. To find the velocity of the pulſes, the denſity and elaſtic force of the medium being given.

" This is the 49th prop. B. 2. Newton, in which he ſhows, that whilſt a pendulum, whoſe length is equal to the height of the homogeneous atmoſphere, vibrates once forward and backwards, the pulſes will deſcribe a ſpace equal to the periphery of a circle deſcribed with that altitude as its radius.

" *Cor.* 1. He thence ſhows, that the velocity of the pulſes is equal to that which a heavy body would acquire in falling down half the altitude of that homogeneous atmoſphere; and therefore, that all pulſes move equally faſt, whatever be the magnitude of PS, or the time of its being deſcribed; that is, whether the tone be loud or low, grave or acute. See *Hales de Sonis*, § 49.

" *Cor.* 2. And alſo, that the velocity of the pulſes is in a ratio compounded of the direct ſubduplicate ratio of the elaſtic force of the medium, and the inverſe ſubduplicate of its denſity. Hence ſounds move ſomewhat faſter in ſummer than in winter. See *Hales de Sonis*, p. 141.

" 11. The ſtrength of a tone is as the moment of the particles of air. The moment of theſe particles, (the medium being given) is as their velocity; and the velocity of theſe particles is as the velocity of the ſtring which ſets them in motion (9). The velocities of two different ſtrings are equal when the ſpaces which they deſcribe in their vibrations are to each other as the times of theſe vibrations: therefore, two different tones are of equal ſtrength, when the ſpaces, through which the ſtrings producing them vibrate, are directly as their vibration.

Plate III. " 12. Let the ſtrength of the tones of the two ſtrings AB, CD, which differ in tenſion only (fig. 1, 2.) be equal. Quere the ratio of the inflecting forces F and *f*. From the hypotheſis of the equality of the ſtrength of the tones, it follows (11), that the ſpace GE muſt be to the ſpace HF as $f^{\frac{1}{2}}$ to $F^{\frac{1}{2}}$, (*Smith's Harm. Prop.* 24. *Cor.* 4.) Now the forces inflecting AB, CD through the equal ſpaces GE, HP are to each other as the tending forces, that is, as F to *f*. (*Malcolm's Treatiſe on Muſic, p.* 52.) But the force inflecting CD through HP is to the force inflecting it through HF as HP or GE to HF, (*ib. p.* 47.) that is, by the hyp. as $f^{\frac{1}{2}}$ to $F^{\frac{1}{2}}$. Therefore, *ex æquo*, the forces inflecting AB and CD, when the tones are equally ſtrong, are to each other as $F+f^{\frac{1}{2}}$ to $f+F^{\frac{1}{2}}$, or as $F^{\frac{1}{2}}$ to $f^{\frac{1}{2}}$. That is, the forces neceſſary to produce tones of equal ſtrength in various ſtrings which differ only in tenſion, are to each other in the ſubduplicate ratio of the tending forces, that is, inverſely as the time of one vibration, or directly as the number of vibrations performed in a given time. Thus, if CD be the acute octave to A B, its tending force will be quadruple that of AB, (*Malcolm's Treatiſe on Muſic*, p. 53); and therefore to produce tones of equal ſtrength in theſe ſtrings, the force impelling CD muſt be double that impelling AB: and ſo in other caſes.

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Plate III.

" Suppoſe, now, that the ſtrings AB, CD, (fig. 2, 3.) differ in length only. The force inflecting AB through GE is to the tending force, which is given, as GE to AG; and this tending force is to the force inflecting CD through the ſpace HP equal to GE, as HD to HP. Therefore, *ex æquo*, the forces inflecting AB and CD through the equal ſpaces GE and HP, are to each other as HD to AG, or as CD to AB, But the force inflecting CD through HP is to the force inflecting it through HF, as HP or GE to HF, that is, becauſe theſe ſpaces are as the times (11), as AB to CD. Therefore, *ex æquo*, the forces inflecting AB and CD, when the tones are equally ſtrong, are to each other in a ratio of equality. Hence we ſhould ſuppoſe, that in this caſe, an equal number of equal impulſes would generate equally powerful tones in theſe ſtrings. But we are to obſerve, that the longer the ſtring, the greater, *cæteris paribus*, is the ſpace through which a given force inflects it (*Malcolm*); and therefore whatever diminution is produced in the ſpaces thro' which the ſtrings move in their ſucceſſive vibrations, ariſing either from the want of perfect elaſticity in the ſtrings or from the reſiſtance of the air, this diminution will bear a greater proportion to the leſs ſpace, through which the ſhorter ſtring vibrates. And this is confirmed by experience; for we find that the duration of the tone and motion of the whole ſtring exceeds that of any of its ſubordinate parts. Therefore, after a given interval of time, a greater quantity of motion will remain in the longer ſtring; and conſequently, after the ſucceſſive equal impulſes have been made, a greater degree of motion will ſtill ſubſiſt in it. That is, a given number of equal impulſes being made on various ſtrings differing in length only, a ſtronger ſound will be produced in that which is the longer."

Chap. III. *Of the Velocity*, &c. *of Sound.* *Axioms.*

Experience has taught us, that ſound travels at about the rate of 1142 feet in a ſecond, or near 13 miles in a minute; nor do any obſtacles hinder its progreſs, a contrary wind only a ſmall matter diminiſhing its velocity. The method of calculating its progreſs is eaſily made known. When a gun is diſcharged at a diſtance, we ſee the fire long before we hear the ſound. If then we know the diſtance of the place, and know the time of the interval between our firſt ſeeing the fire and then hearing the report, this will ſhow us exactly the time the ſound has been travelling to us. For inſtance, if the gun is diſcharged a mile off, the moment the flaſh is ſeen, you take a watch and count the ſeconds till you hear the ſound; the number of ſeconds is the time the ſound has been travelling a mile.—Again, by the above axiom, we are enabled to find the diſtance between objects that would be otherwiſe immeaſurable. For example, ſuppoſe you ſee the flaſh of a gun in the night at ſea, and tell ſeven ſeconds before you hear the report, it follows therefore, that the diſtance is ſeven times 1142 feet, that is, 24 yards more than a mile and a half. In like manner, if you obſerve the number of ſeconds between the lightning and the report of the thunder, you know the diſtance of the cloud from whence it proceeds.

14 Velocity of ſound.

15 Its progreſs calculated.

16 Diſtances calculated by means of ſound.

Derham has proved by experience, that all ſounds whatever travel at the ſame rate. The ſound of a gun, and

17 All ſounds travel at the ſame rate.

and the ſtriking of a hammer, are equally ſwift in their motions: the ſofteſt wiſper flies as ſwiftly, as far as it goes, as the loudeſt thunder.

To theſe axioms we may add the following.

18 Smooth and clear ſounds proceed from bodies that are homogeneous, and of an uniform figure; and harſh or obtuſe ſounds, from ſuch as are of a mixed matter and irregular figure.

19 The velocity of ſound is to that of a briſk wind as fifty to one.

20 The ſtrength of ſounds is greateſt in cold and denſe air, and leaſt in that which is warm and rarefied.

21 Every point againſt which the pulſes of ſound ſtrike, become a centre from which a new ſeries of pulſes are propagated in every direction.

22 Sound deſcribes equal ſpaces in equal times.

Chap. IV. *Of Reverberated Sounds.*

23 Sound, like light, after it has been reflected from ſeveral places may be collected in one point, as into a focus; and it will be there more audible than in any other part, even than at the place from whence it proceeded. On this principle it is that a wiſpering gallery is conſtructed.

24 Whiſpering Gallery, Plate I. fig. 3.

The form of this gallery muſt be that of a concave hemiſphere (E), as ABC; and if a low ſound or whiſper be uttered at A, the vibrations expanding themſelves every way will impinge on the points DDD, &c. and from thence be reflected to EEE, and from thence to the points F and G, till at laſt they all meet in C, where, as we have ſaid, the ſound will be the moſt diſtinctly heard.

25 Speaking-trumpet, fig. 4.

The augmentation of ſound by means of ſpeaking-trumpets, is uſually illuſtrated in the following manner: Let ABC be the tube, BD the axis, and B the mouth-piece for conveying the voice to the tube. Then it is evident, when a perſon ſpeaks at B in the trumpet, the whole force of his voice is ſpent upon the air contained in the tube, which will be agitated through the whole length of the tube; and, by various reflections from the ſide of the tube to the axis, the air along the middle part of the tube will be greatly condenſed, and its *momentum* proportionably increaſed, ſo that when it comes to agitate the air at the orifice of the tube AC, its force will be as much greater than what it would have been without the tube, as the ſurface of a ſphere, whoſe radius is equal to the length of the tube, is greater than the ſurface of the ſegment of ſuch a ſphere whoſe baſe is the orifice of the tube. For a perſon ſpeaking at B, without the tube, will have the force of his voice ſpent in exciting concentric ſuperficies of air all around the point B; and when thoſe ſuperficies or pulſes of air are diffuſed as far as D every way, it is plain the force of the voice will there be diffuſed through the whole ſuperficies of a ſphere whoſe radius is BD; but in the trumpet it will be ſo confined, that at its exit it will be diffuſed through ſo much of that ſpherical ſurface of air as correſponds to the orifice of the tube. But ſince the force is given, its intenſity will be always inverſely as the number of particles it has to move; and therefore in the tube it will be to that without, as the ſuperficies of ſuch a ſphere to the æra of the large end of the tube nearly.

But it is obvious, Mr Young obſerves, that the confinement of the voice can have little effect in increaſing the ſtrength of the ſound, as this ſtrength depends on the velocity with which the particles move. Were this reaſoning concluſive, the voice ſhould iſſue through the ſmalleſt poſſible orifice; cylindrical tubes would be preferable to any that increaſed in diameter; and the leſs the diameter, the greater would be the effect of the inſtrument; becauſe the plate or maſs of air to be moved, would, in that caſe, be leſs, and conſequently the effect of the voice the greater; all which is contradicted by experience.

The cauſe of the increaſe of ſound in theſe tubes muſt therefore be derived from ſome other principles: and amongſt theſe we ſhall probably find, that what the ingenious Kircher has ſuggeſted in his Phonurgia is the moſt deſerving of our attention. He tells us, that "the augmentation of the ſound depends on its reflection from the tremulous ſides of the tube; which reflections, conſpiring in propagating the pulſes in the ſame direction, muſt increaſe its intenſity." Newton alſo ſeems to have conſidered this as a principal cauſe, in the ſcholium of prop. 50. B. 2. Princip. when he ſays, "we hence ſee why ſounds are ſo much encreaſed in ſtentorophonic tubes, for every reciprocal motion is, in each return, increaſed by the generating cauſe.

Farther, when we ſpeak in the open air, the effect on the tympanum of a diſtant auditor is produced merely by a ſingle pulſe. But when we uſe a tube, all the pulſes propagated from the mouth, except thoſe in the direction of the axis, ſtrike againſt the ſides of the tube, and every point of impulſe becoming a new centre, from whence the pulſes are propagated in all directions, a pulſe will arrive at the ear from each of thoſe points; thus, by the uſe of a tube, a greater number of pulſes are propagated to the ear, and conſequentby the ſound increaſed. The confinement too of the voice may have ſome effect, though not ſuch as is aſcribed to it by ſome: for the condenſed pulſes produced by the naked voice, freely expand every way; but in tubes, the lateral expanſion being diminiſhed, the direct expanſion will be increaſed, and conſequently the velocity of the particles, and the intenſity of the ſound. The ſubſtance alſo of the tube has its effect; for it is found by experiment, that the more elaſtic the ſubſtance of the tube, and conſequently the more ſuſceptible it is of theſe tremulous motions, the ſtronger is the ſound.

If the tube be laid on any non-elaſtic ſubſtance, it deadens the ſound, becauſe it prevents the vibratory motion of the parts. The ſound is increaſed in ſpeaking trumpets, if the tube be ſuſpended in the air; becauſe the agitations are then carried on without interruption. Theſe tubes ſhould increaſe in diameter from the mouth piece, becauſe the parts, vibrating in directions perpendicular to the ſurface, will conſpire in impelling forward the particles of air, and conſequently, by increaſing their velocity, will increaſe the intenſity of the ſound: and the ſurface alſo increaſing, the number of points of impulſe and of new propagations will increaſe pro-

(E) A cylindric or elliptic arch will anſwer ſtill better than one that is circular.

Reverberated Sounds.

proportionally. The several causes, therefore, of the increase of the sound in these tubes, Mr Young concludes to be, 1. The diminution of the lateral, and consequently the increase of the direct, expansion and velocity of the included air. 2. The increase of the number of pulses, by increasing the points of new propagation. 3. The reflections of the pulses from the tremulous sides of the tube, which impel the particles of air forward, and thus increase their velocity.

26 Echoes.

An echo is a reflection of sound striking against some object, as an image is reflected in a glass: but it has been disputed what are the proper qualities in a body for thus reflecting sounds. It is in general known, that caverns, grottoes, mountains, and ruined buildings, return this image of sound. We have heard of a very extraordinary echo, at a ruined fortress near Louvain in Flanders. If a person sung, he only heard his own voice, without any repetition: on the contrary, those who stood at some distance, heard the echo but not the voice; but then they heard it with surprising variations, sometimes louder, sometimes softer, now more near, then more distant. There is an account in the memoirs of the French academy, of a similar echo near Rouen.

As (by n° 21 and 22) every point against which the pulses of sounds strike becomes the centre of a new series of pulses, and sound describes equal distances in equal times; therefore, when any sound is propagated from a centre, and its pulses strike against a variety of obstacles, if the sum of the right lines drawn from that point to each of the obstacles, and from each obstacle to a second point, be equal, then will the later be a point in which an echo will be heard. "Thus let A be the point from which the sound is propagated in all directions, and let the pulses strike against the obstacles C, D, E, F, G, H, I, &c. each of these points becomes a new centre of pulses by the first principle, and therefore from each of them one series of pulses will pass through the point B. Now if the several sums of the right lines $\overline{AC+CB}$, $\overline{AD+DB}$, $\overline{AE+EB}$, $\overline{AG+GB}$, $\overline{AH+HB}$, $\overline{AI+IB}$, &c. be all equal to each other, it is obvious that the pulses propagated from A to these points, and again from these points to B, will all arrive at B at the same instant, according to the second principle; and therefore, if the hearer be in that point, his ear will at the same instant be struck by all these pulses. Now it appears from experiment (*see Musschenbroek, V.* ii. *p.* 210), that the ear of an exercised musician can only distinguish such sounds as follow one another at the rate of 9 or 10 in a second, or any slower rate: and therefore, for a distinct perception of the direct and reflected sound, there should intervene the interval of $\frac{1}{9}$th of a second; but in this time sound describes $\frac{1142}{9}$ or 127 feet nearly. And therefore, unless the sum of the lines drawn from each of the obstacles to the points A and B exceeds the interval AB by 127 feet, no echo will be heard at B. Since the several sums of the lines drawn from the obstacles to the points A and B are of the same magnitude, it appears that the curve passing through all the points C, D, E, F, G, H, I, &c. will be an ellipse, (*prop.* 4. *B.* 2. *Ham. Con.*) Hence all the points of the obstacles which produce an echo, must lie in the surface of the oblong spheroid, generated by the revolution of this ellipse round its major axis.

"As there may be several spheroids of different magnitudes, so there may be several different echoes of the same original sound. And as there may happen to be a greater number of reflecting points in the surface of an exterior spheroid than in that of an interior, a second or a third echo may be much more powerful than the first, provided that the superior number of reflecting points, that is, the superior number of reflected pulses propagated to the ear, be more than sufficient to compensate for the decay of sound which arises from its being propagated through a greater space. This is finely illustrated in the celebrated echoes at the lake of Killarney in Kerry, where the first return of the sound is much inferior in strength to those which immediately succeed it.

"From what has been laid down it appears, that for the most powerful echo, the sounding body should be in one focus of the ellipse which is the section of the echoing spheroid, and the hearer in the other. However, an echo may be heard in other situations, though not so favourably; as such a number of reflected pulses may arrive at the same time at the ear as may be sufficient to excite a distinct perception. Thus a person often hears the echo of his own voice; but for this purpose he should stand at least 63 or 64 feet from the reflecting obstacle, according to what has been said before. At the common rate of speaking, we pronounce not above three syllables and an half, that is, seven half syllables in a second; therefore, that the echo may return just as soon as three syllables are expressed, twice the distance of the speaker from the reflecting object must be equal to 1000 feet; for, as sound describes 1142 feet in a second, $\frac{6}{7}$ths of that space, that is, 1000 feet nearly, will be described while six half or three whole syllables are pronounced: that is, the speaker must stand near 500 feet from the obstacle. And in general, the distance of the speaker from the echoing surface, for any number of syllables, must be equal to the seventh part of the product of 1142 feet multiplied by that number.

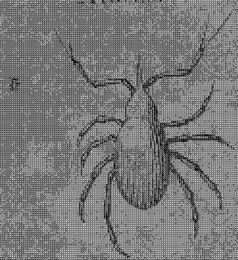
"In churches we never hear a distinct echo of the voice, but a confused sound when the speaker utters his words too rapidly; because the greatest difference of distance between the direct and reflected courses of such a number of pulses as would produce a distinct sound, is never in any church equal to 127 feet, the limit of echoes.

"But though the first reflected pulses may produce no echo, both on account of their being too few in number, and too rapid in their return to the ear; yet it is evident, that the reflecting surface may be so formed, as that the pulses which come to the ear after two reflections or more may, after having described 127 feet or more, arrive at the ear in sufficient numbers, and also so nearly at the same instant, as to produce an echo, though the distance of the reflecting surface from the ear be less than the limit of echoes. This is confirmed by a singular echo in a grotto on the banks of the little brook called the Dianan, about two miles from Castlecomber, in the county of Kilkenny. As you enter the cave, and continue speaking loud, no return of the voice is perceived: but on your arriving at

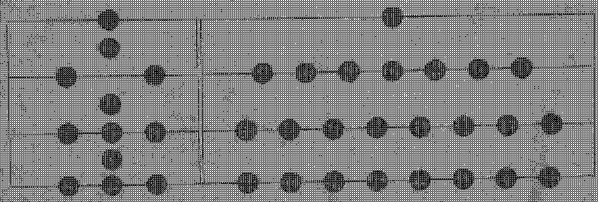
a

Plate I.

Acarus.



Abacus.



Aphis.

Acoustics

Fig. 1.

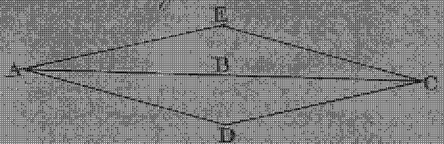


Fig. 2.

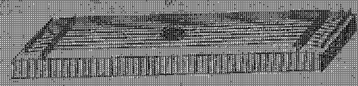
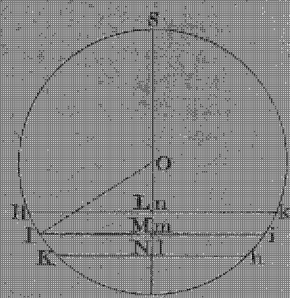


Fig. 7.



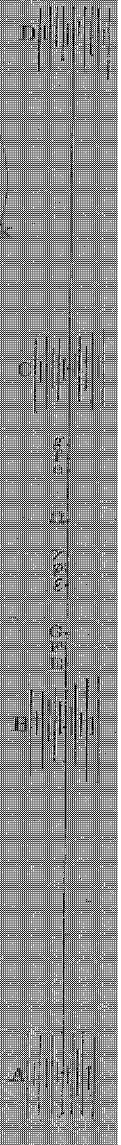


Fig. 3.

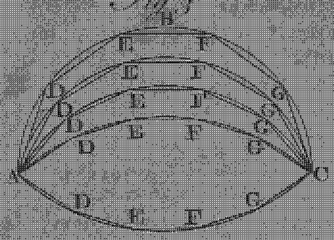


Fig. 4.

Fig. 5.

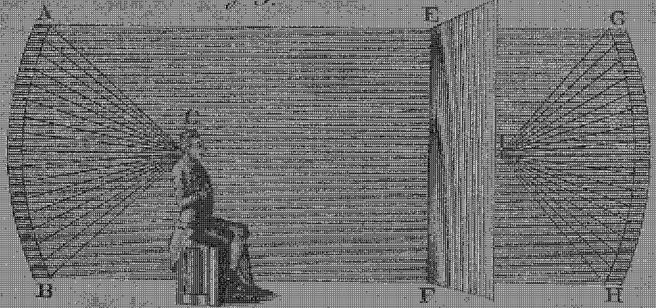
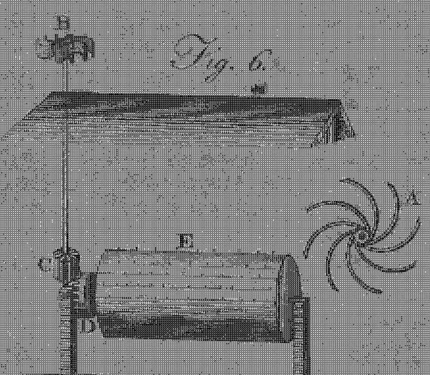


Fig. 6.



Aerostation.

Fig. 1.

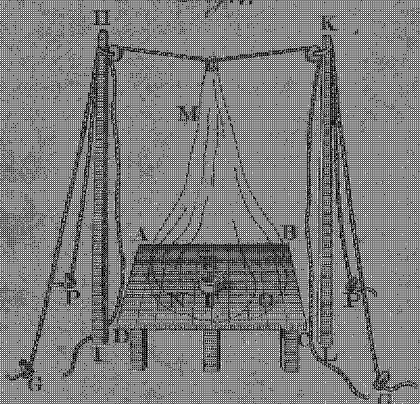
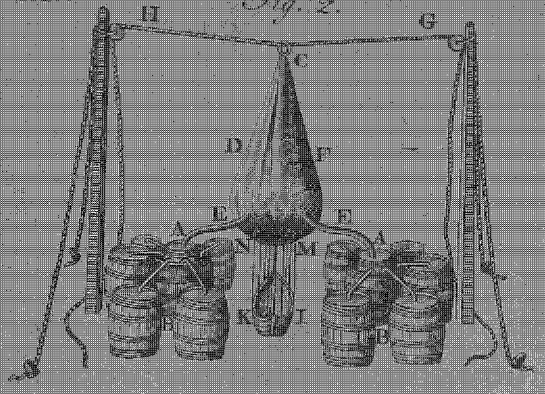


Fig. 2.



R. Scot sculp.

Entertaining Experiments, &c.

a certain point, which is not above 14 or 15 feet from the reflecting surface, a very distinct echo is heard. Now this echo cannot arise from the first course of pulses that are reflected to the ear, because the breadth of the cave is so small, that they would return too quickly to produce a distinct sensation from that of the original sound: it therefore is produced by those pulses, which, after having been reflected several times from one side of the grotto to the other, and having run over a greater space than 127 feet, arrive at the ear in considerable numbers, and not more distant from each other, in point of time, than the ninth part of a second."

This article shall be dismissed with a few inventions founded on some of the preceding principles, which may amuse a number of our readers.

Entertaining Experiments and Contrivances.

27 I. the Conversive Statue, Plate I. fig. 5.

I. PLACE a concave mirror of about two feet diameter, as AB (G), in a perpendicular direction. The focus of this mirror may be at 15 or 18 inches distance from its surface. At the distance of about five or six feet let there be a partition, in which there is an opening E F, equal to the size of the mirror: against this opening must be placed a picture, painted in water-colours, on a thin cloth, that the sound may easily pass through it (H).

Behind the partition, at the distance of two or three feet, place another mirror G H, of the same size as the former, and let it be diametrically opposite to it.

At the point C let there be placed the figure of a man seated on a pedestal, and let his ear be placed exactly in the focus of the first mirror: his lower jaw must be made to open by a wire, and shut by a spring; and there may be another wire to move the eyes: these wires must pass through the figure, go under the floor, and come up behind the partition.

Let a person, properly instructed, be placed behind the partition near the mirror. You then propose to any one to speak softly to the statue, by putting his mouth to the ear of it, assuring him that it will answer instantly. You then give the signal to the person behind the partition, who, by placing his ear to the focus I, of the mirror G H, will hear distinctly what the other said; and, moving the jaw and eyes of the statue by the wires, will return an answer directly, which will in like manner be distinctly heard by the first speaker.

This experiment appears to be taken from the Century of Inventions of the Marquis of Worcester; whose designs, at the time they were published, were treated with ridicule and neglect as being impracticable, but are now known to be generally, if not universally practicable. The words of the Marquis are these: "How to make a brazen or stone head in the midst of a great field or garden, so artificial and natural, that though a man speak ever so softly, and even whisper into the ear thereof, it will presently open its mouth, and resolve the question in French, Latin, Welsh, Irish, or English in good terms, uttering it out of its mouth, and then shut it until the next question be asked."—The two following, of a similar nature, appear to have been inventions of Kircher, by means of which (as he informs us *) he used to "utter feigned and ludicrous consultations, with a view to show the fallacy and imposture of ancient oracles."

* *Phonurgia Novi*, sect. vi. c. I.

28 The communicative Busts.

II. Let there be two heads of plaster of Paris, placed on pedestals, on the opposite sides of a room. There must be a tin tube of an inch diameter, that must pass from the ear of one head, through the pedestal, under the floor, and go up to the mouth of the other. Observe, that the end of the tube which is next the ear of the one head, should be considerably larger than that end which comes up to the mouth of the other. Let the whole be so disposed that there may not be the least suspicion of a communication.

Now, when a person speaks, quite low, into the ear of one bust, the sound is reverberated thro' the length of the tube, and will be distinctly heard by any one who shall place his ear to the mouth of the other. It is not necessary that the tube should come to the lips of the bust.—If there be two tubes, one going to the ear, and the other to the mouth, of each head, two persons may converse together, by applying their mouth and ear reciprocally to the mouth and ear of the bust; and at the same time other persons that stand in the middle of the chamber, between the heads, will not hear any part of their conversation.

29 The Oracular Head.

III. PLACE a bust on a pedestal in the corner of a room, and let there be two tubes, as in the foregoing amusement, one of which must go from the mouth and the other from the ear of the bust, through the pedestal, and the floor, to an under apartment. There may be likewise wires that go from the under jaw and the eyes of the bust, by which they may be easily moved.

A person being placed in the under room, and at a signal given applying his ear to one of the tubes, will hear any question that is asked, and immediately reply; moving at the same time, by means of the wires, the mouth and the eyes of the bust, as if the reply came from it.

30 A Solar Sonata.

IV. In a large case, such as is used for dials and spring clocks, the front of which, or at least the lower part of it, must be of glass, covered on the inside with gauze, let there be placed a barrel-organ, which, when wound up, is prevented from playing, by a catch that takes a toothed wheel at the end of the barrel. To one end of this catch there must be joined a wire, at the end of which there is a flat circle of cork, of the same dimension with the inside of a glass tube, in which it is to rise and fall. This tube must communicate with a reservoir that goes across the front part of the bottom of the case, which is to be filled with spirits, such as is used in ther-

(G) Both the mirrors here used may be of tin or gilt pasteboard, this experiment not requiring such as are very accurate.

(H) The more effectually to conceal the cause of this allusion, the mirror AB may be fixed in the wainscot, and a gauze or any other thin covering thrown over it, as that will not in the least prevent the sound from being reflected. An experiment of this kind may be performed in a field or garden, between two hedges, in one of which the mirror AB may be placed, and in the other an opening artfully contrived.

Entertaining Experiments, &c. thermometers, but not coloured, that it may be the better concealed by the gauze.

This case being placed in the sun, the spirits will be rarefied by the heat; and rising in the tube, will lift up the catch or trigger, and set the organ in play: which it will continue to do as long as it is kept in the sun; for the spirits cannot run out of the tube, that part of the catch to which the circle is fixed being prevented from rising beyond a certain point by a check placed over it.

When the machince is placed against the side of a room on which the sun shines strong, it may constantly remain in the same place, if you inclose it in a second case, made of thick wood, and placed at a little distance from the other. When you want it to perform, it will be only necessary to throw open the door of the outer case, and expose it to the sun.

But if the machine be moveable, it will perform in all seasons by being placed before the fire; and in the winter it will more readily stop when removed into the cold.

A machine of this sort is said to have been invented by Cornelius Dreble, in the last century. What the construction of that was, we know not; it might very likely be more complex, but could scarce answer the intention more readily.

31 Automatous Harpsichord. V. Under the keys of a common harpschord let there be fixed a barrel, something like that in a chamber organ, with stops or pins corresponding to the tunes you would have it play. These stops must be moveable, so that the tunes may be varied at pleasure. From each of the keys let there go a wire perpendicular down: the ends of these wires must be turned up for about one-fourth of an inch. Behind these wires let there be an iron bar, to prevent them from going too far back. Now, as the barrel turns round, its pins take the ends of the wires, which pull down the keys, and play the harpsichord. The barrel and wires are to be all inclosed in a case.

In the chimney of the same room where the harpsichord stands, or at least in one adjacent, there must be a smoke jack, from whence comes down a wire, or cord, that, passing behind the wainscot adjoining the chimney, goes under the floor, and up one of the legs of the harpsichord, into the case, and round a small wheel fixed on the axis of that first mentioned. There should be pullies at different distances, behind the wainscot and under the floor, to facilitate the motion of the chord. Entertaining experiments, &c.

This machinery may be applied to any other keyed instrument as well as to chimes, and to many other purposes where a regular continued motion is required.

An instrument of this sort may be considered as a perpetual motion, according to the vulgar acceptation of the term; for it will never cease going till the fire be extinguished, or some parts of the machinery be worn out.

VI. At the top of a summer-house, or other building, let the wind-wheel B (of which A is an horizontal section,) be on the upper end of the perpendicular axis F; on the lower end of which is fixed the pinion C that takes the toothed wheel D on the axis of the great wheel E—The perpendicular axis F goes down very near the wall of the room, and may be covered after the same manner as are bell-wires. In the great wheel there must be placed a number of stops, corresponding to the tunes it is to play. These stops are to be moveable, that the tunes may be altered at pleasure. Against this wheel there must hang 12 small bells, answering to the notes of the gamut. Therefore, as the wheel turns round, the stops striking against the bells, play the several tunes. There should be a fly to the great wheel, to regulate its motion when the wind is strong. The wheel E, and the bells, are to be inclosed in a case. 32 A Ventosal Symphony, Plate I. fig. 6.

There may be several sets of bells, one of which may answer to the tenor, another to the treble, and a third to the bass; or they may play different tunes, according to the size of the wheel. As the bells are small, if they are of silver, their tone will be the more pleasing.

Instead of bells, glasses may be here used, so disposed as to move freely at the stroke of the stops. This machinery may likewise be applied to a barrel-organ; and to many other uses.

ACQ

Acqs | Acqui.

ACQS, a town at the foot of the Pyrenæan mountains, in the government of Foix in France. It takes its name from the hot waters in these parts. E. long. 1. 40. lat. 43. 0.

ACQUAPENDENTE, a pretty large town of Italy, in the territory of the church, and patrimony of St Peter, with a bishop's see It is seated on a mountain, near the river Paglia, ten miles W. of Orvietto, and 57 N. by W. of Rome. E. long. 11. 53. Lat. 42. 43.

ACQUARIA, a small town of Italy, in Frigana, a district of Modena, which is remarkable for its medicinal waters. It is 12 miles south of the city of Modena. E. long. 11. 17. lat. 44. 24.

ACQUEST, or Acquist, in law, signifies goods got by purchase or donation. See Conquest.

ACQUI, a town of Italy, in the duchy of Montserrat, with a bishop's see, and commodious baths. It was taken by the Spaniards in 1745, and retaken by the Piedmontese in 1746; but after this, it was taken again and dismantled by the French, who afterwards forsook it. It is seated on the river Bornia, 25 miles N. W. of Genoa, and 30 S. of Casal. E. long. 8. 30. Lat. 44. 40.

Acquisition | Acquittance.

ACQUISITION, in general, denotes the obtaining or procuring something. Among lawyers, it is used for the right or title to an estate got by purchase or donation.

ACQUITTAL, a discharge, deliverance, or setting of a person free from the guilt or suspicion of an offence.

ACQUITTANCE, a release or discharge in writing for a sum of money, witnessing that the party has paid the said sum.—No man is obliged to pay a sum of money

money if the demandant refuses to give an acquittance, which is a full discharge, and bars all actions, &c. An acquittance given by a servant for a sum of money received for the use of his master, shall be a good discharge for that sum, provided the servant used to receive his master's rents, debts, &c.

ACRA, a town of Africa, on the coast of Guinea, where the English, Dutch, and Danes, have strong forts, and each fort its particular village. W. Long. 0. 2. Lat. 5. 0.

ACRA (anc. geog.), one of the hills of Jerusalem, on which stood the lower town, which was the Old Jerusalem; to which was afterwards added Zion, or the city of David. Probably called *Acra*, from the fortress which Antiochus built there in order to annoy the temple, and which Simon Maccabæus took and razed to the ground.

Acra Japygia (anc. geog.), called *Salentia* by Ptolemy; now *Capo di San Maria di Leuca:* A promontory in the kingdom of Naples, to the south-east of Otranto, where formerly was a town, now lying in ruins, on the Ionian sea, over against the Montes Acroceraunii of Epirus.

ACRÆ (anc. geog.), a town of Sicily, whose inhabitants were called *Acrenses*. It stood to the south of Syracuse at the distance of 24 miles, near the place now called the monastery of *Santa Maria d'Arcia*, on an eminence, as appears from Silius Italicus. The Syracusans were the founders of it, according to Thucidydes, 70 years after the building of Syracuse, or 665 before Christ. Hence the epithet *Acræus*.

ACRAGAS, or AGRAGAS (anc. geog.), so called by the Greeks, and sometimes by the Romans, but more generally *Agrigentum* by the latter; a town of Sicily. In Greek medals the inhabitants are called ΑΚΡΙΓΑΝΤΙΝΟΙ, and *Agrigentini* by Cicero. The town stood upon a mountain, at the confluence of the Acragas and Hypsa, near the port called Εμποριον by Ptolemy, but Επινειον, or the Dock, by Strabo; and in the time of the latter, scarce a trace of all that side remained. In the year before Christ 384, the people of Gela built Acragas, 108 years after building their own city. It took its name from the river running by it; and being but two miles from, enjoyed all the conveniences that should come by, the sea. It was a place of great strength, standing on the top of a very steep rock, and washed on the south side by the river Acragas, now called *Fiume di Gergenti*, and on the south-west by the Hypsa, with a citadel to the south-east, externally surrounded by a deep gulf, which made it inaccessible but on the side next the town. It was famous for the tyrant Phalaris and his brazen bull. They were a people luxurious in their tables, and magnificent in their dwellings; of whom Empedocles, in Diogenes Laertius, says, that they lived to-day as if they were to die to-morrow, and built as if they were to live forever. The country round the city was laid out in vine and olive yards, in the produce of which they carried on a great and profitable commerce with Carthage. E. Long. 13. 30. Lat. 37. 20.

ACRASIA, among physicians, implies the predominancy of one quality above another, either with regard to artificial mixtures, or the humours of the human body. The word is Greek, and compounded of α, priv. and κεραννυμι, to *mix*; q. d. not mixed in a just proportion.

ACRATH (anc. geog.), a place in Mauritania Tingitana, now supposed to be *Velez de Gomara:* A fortified town in the kingdom of Fez, with a capital and commodious harbour on the Mediterranean, scarce a mile distant from Penon de Velez, a Spanish fort. W. Long. 5. Lat. 34. 45.

ACRE, or ACRA, a sea-port town in Syria. It was formerly called *Ptolemais*, and is a bishop's see. It was very famous in the time of the crusadoes, and underwent several sieges both by the Christians and Saracens. It is situated at the north angle of a bay, which extends in a semicircle of three leagues, as far as the point of Carmel.

During the Crusades, the possession of this town was long disputed by the Christians and Saracens. In 1192 it was taken from the latter by Richard I. of England and Philip of France, who gave it to the knights of St John of Jerusalem, who kept possession of it 100 years, when it was retaken by the Saracens, and almost entirely destroyed. This event is rendered memorable by an act of singular resolution with which it was accompanied. A number of beautiful young nuns, terrified at the prospect of being exposed to the brutal lust of the infidels, determined to avoid the violation of their chastity, by rendering themselves objects of aversion. With this view they cut off their noses and mangled their faces. The Saracens, inflamed with resentment at a spectacle which prevented the gratification of their appetites, immediately put them all to the sword. After the expulsion of the crusaders, it remained almost deserted; but in our time has again revived by the industry of Daher; and the works erected by Djezzar, within the last ten years, have rendered it one of the principal towns upon the coast. The mosque of this Pacha is boasted as a masterpiece of eastern taste. The bazar, or covered market, is not inferior even to those of Aleppo; and its public fountain surpasses in elegance those of Damascus, though the water is of a very indifferent quality. The Pacha has derived the more honour from these works, as he was himself both the engineer and architect: he formed the plans, drew the designs, and superintended the execution.

The port of Acre is one of the best situated on the coast, as it is sheltered from the north and north-west winds by the town itself; but it is greatly choaked up since the time of Fakr-el-din. Djezzar has contented himself with making a landing-place for boats. The fortifications, though more frequently repaired than any other in all Syria, are of no importance: there are only a few wretched low towers, near the port, on which cannon are mounted; and these rusty iron pieces are so bad, that some of them burst every time they are fired. Its defence on the land side is merely a garden-wall, without any ditch.

Corn and cotton form the basis of the commerce of Acre, which is becoming more flourishing every day. Of late, the Pacha, by an abuse common throughout all the Turkish empire, has monopolized all the trade in his own hands; no cotton can be sold but to him, and from him every purchase must be made. In vain have the European merchants claimed the privileges

Acre.

granted them by the Sultan; Djezzar replied, that he was the Sultan in his country, and continued his monopoly. These merchants in general are French, and have six houses at Acre, with a consul; an Imperial agent too is lately settled there; also a resident for Russia.

That part of the bay of Acre, in which ships anchor with the greatest security lies to the north of Mount Carmel, below the village of Haifa (commonly called *Caiffa*). The bottom is good holding ground, and does not chafe the cables; but the harbour is open to the north-west wind, which blows violently along all this coast. Mount Carmel, which commands it to the south, is a flattened cone, and very rocky; it is about 2000 feet high. We still find among the brambles wild vines and olive trees, which prove that industry has formerly been employed even in this ungrateful soil: on the summit is a chapel dedicated to the prophet Elias, which affords an extensive prospect over the sea and land. It is 20 miles S. of Tyre, and 37 N. of Jerusalem. E. Long. 39. 25. Lat. 32. 40.

Acre, in the Mogul's dominions, the same with lack, and signifies the sum of 100,000 rupees; the rupee is of the value of the French crown of three livres, of 30 sols of Holland; an 100 lacks of rupees make a couron in Indostan, or 10,000,000 rupees: the pound Sterling is about eight rupees; according to which proportion, a lack of rupees amounts to 12,500 pounds Sterling.

Acre, the universal measure of land in Britain. The word (formed from the Saxon *acher*, or the German *aker*, a field), did not originally signify a determined quantity of land, but any open ground, especially a wide champaign; and in this antique sense it seems to be preserved in the names of places, as Castle-acre, West-acre, &c. An acre in England contains four square roods, a rood 40 perches or poles of $16\frac{1}{2}$ feet each by statute. Yet this measure does not prevail in all parts of England, as the length of the pole varies in different counties, and is called *customary measure*, the difference running from the $16\frac{1}{2}$ feet to 28. The acre is also divided into 10 square chains, of 22 yards each, that is, 4840 square yards. An acre in Scotland contains four square roods; one square rood is 40 square falls; one square fall, 36 square ells; one square ell, nine square feet and 73 square inches; one square foot, 144 square inches. The Scots acre is also divided into 10 square chains; the measuring chain should be 24 ells in length, divided into 100 links, each link $8\frac{928}{1000}$ inches; and so one square chain will contain 10,000 square links. The English statute-acre is about three roods and six falls standard measure of Scotland.

The French acre, *arpent*, contains $1\frac{1}{4}$ English acre, or 54,450 square English feet, whereof the English acre contains only 43,560.—The Strasburgh acre is about half an English acre.—The Welsh acre contains commonly two English ones.—The Irish acre is equal to one acre two roods and 19 perches $\frac{27}{121}$, English.

Dr Grew attempts to ascertain the number of acres in England, which, according to him, amounts to 46 millions and 80,000. The United Provinces are said to contain 4,382,000 acres: The province of Holland but one million of acres. The territory of the United States of America, according to calculations lately made by order of Congress, contains 589 millions of acres, exclusive of water, which is computed at 51 millions more.

Acre-Fight | Acridophagi.

Acre-Fight, and old sort of duel fought by English and Scottish combatants, between the frontiers of their kingdoms, with sword and lance: it was also called *camp-fight*, and the combatants *champions*, from the open field being the stage of trial.

Acre-Tax, a tax laid on land at so much per acre. In some places this is also called *acre-shot*. Impositions on lands in the great level are to be raised by a proportionable acre-tax, 20 Car. II. cap. 8.—An acre-tax of 2s. 6d. per acre, for draining Hadenham-level, 13 Geo. I. cap. 18.

ACRIBEIA, a term purely Greek, literally denoting an exquisite or delicate accuracy; sometimes used in our language, for want of a word of equal signification.

ACRID, a name for any thing that is of a sharp or pungent taste. See Materia Medica.

ACRIDOPHAGI, in the ancient geography, an Ethiopian people, represented as inhabiting near the deserts, and to have fed on locusts. This latter circumstance their name imports; the word being compounded of the Greek ακρις *locust*, and φαγω to *eat*. We have the following account of them by Diodorus Siculus *. Their stature was lower than that of other men; they were meagre, and extremely black. In the spring, high west winds drove from the desert to their quarter locusts of an extraordinary size, and remarkable for the squalid colour of their wings. So great was the number of these insects, that they were the only sustenance of the barbarians, who took them in the following manner: At the distance of some stadia from their habitations there was a wide and deep valley. They filled this valley with wood and wild herbs, with which their country abounded. When the cloud of locusts appeared, which were driven on by the wind, they set fire to the fuel which they had collected. The smoke which arose from this immense fire was so thick, that the locusts, in crossing the valley, were stifled by it, and fell in heaps on the ground. The passage of the locusts being thus intercepted for many days, they made a large provision of those insects. As their country produced great quantities of salt, they salted them, to render them more palatable, and to make them keep till the next season. This peculiar supply was their sole food: they had neither herds nor flocks. They were unacquainted with fishing; for they lived at a distance from the sea. They were very active, and ran with great swiftness. But their life was not of long duration; it exceeded not forty years. The close of their life was extremely miserable; for in their old age, winged lice of different, but all of ugly forms, bred in their bodies. This malady, which began in the breast and belly, soon spread through the whole frame. The patient at first felt an itching; and the agreeable sensation produced by his scratching of himself, preceded a most deplorable calamity. For when those lice, which had bred in his body, forced their way out, they caused effusions of corrupt blood, with excruciating pains in the skin. The unhappy man, with lamentable cries, was industrious himself to make passages for them with his nails. In short, these lice issued forth successively from the wounds made by the hands

* Lib. iii. & xxxix. Also Strabo, lib. xvi.

hands of the patient, as from a veſſel full of holes, and in ſuch numbers that it was impoſſible to exterminate them.—Whether this extraordinary and dreadful diſtemper was occaſioned by the food of the inhabitants of this country, or by a peſtilential quality of their climate, it is difficult to determine. Indeed, as to the credibility of the whole account, we muſt leave the reader to judge.

But though the circumſtances of theſe people ſhould be deemed fabulous, yet may the *acridophagia* be true. It is well known, that to this day the inhabitants of Ethiopia, Arabia, &c. frequently uſe locuſts as food. The reader will not be diſpleaſed if we lay before him the reſult of Dr Haſſelquiſt's inquiries as to this particular, who travelled in Syria and Egypt ſo late as the year 1752. This ingenious gentleman, who travelled with a view to improve natural hiſtory, informs us, that he aſked Franks, and many other people who had lived long in theſe countries, whether they had ever heard that the inhabitants of Arabia, Ethiopia, &c. uſed locuſts as food. They anſwered that they had. He likewiſe aſked the ſame queſtion of Armenians, Copts, and Syrians, who lived in Arabia, and had travelled in Syria and near the Red Sea; ſome of whom ſaid they heard of ſuch a practice, and others that they had often ſeen the people eat theſe inſects. He at laſt obtained complete ſatisfaction on this head from a learned ſheck at Cairo, who had lived ſix years in Mecca. This gentleman told him, in preſence of M. le Grand the principal French interpreter at Cairo, and others, that a famine frequently rages at Mecca when there is a ſcarcity of corn in Egypt, which obliges the inhabitants to live upon coarſer food than ordinary: That when corn is ſcarce, the Arabians grind the locuſts in hand-mills, or ſtone-mortars, and bake them into cakes, and uſe theſe cakes in place of bread: That he has frequently ſeen locuſts uſed by the Arabians, even when there was no ſcarcity of corn; but then they boil them, ſtew them with butter, and make them into a kind of fricaſſee; which he ſays is not diſagreeably taſted, for he had ſometimes taſted theſe locuſt-fricaſſees out of curioſity.

A later traveller, Dr Sparrman, informs us *, "That locuſts ſometimes afford a high treat to the more unpoliſhed and remote hordes of the Hottentots; when, as ſometimes happens, after an interval of 8, 10, 15, or 20 years, they make their appearance in incredible numbers. At theſe times they come from the north, migrating to the ſouthward, and do not ſuffer themſelves to be impeded by any obſtacles, but fly boldly on, and are drowned in the ſea whenever they come to it. The females of this race of inſects, which are moſt apt to migrate, and are chiefly eaten, are ſaid not to be able to fly; partly by reaſon of the ſhortneſs of their wings, and partly on account of their being heavy and diſtended with eggs; and ſhortly after they have laid theſe in the ſand, they are ſaid to die. It is particularly of theſe that the Hottentots make a brown coffee-coloured ſoup, which, at the ſame time, acquires from the eggs a fat and greaſy appearance. The Hottentots are highly rejoiced at the arrival of theſe locuſts, though they are ſure to deſtroy every bit of verdure on the ground: but the Hottentots make themſelves ample amends for this loſs, by falling foul on the animals themſelves, eating them in ſuch quantities as in the ſpace of a few days to get viſibly fatter and in better condition than before."

* *Voyage to the Cape*, vol. i. p. 36.

The abbé Poiret, alſo, in this Memoir on the Inſects of Barbary and Numidia, informs us, "That the Moors make locuſts a part of their food; that they go to hunt them; fry them in oil and butter; and ſell them publicly at Tunis, at Bonne," &c.

From theſe accounts, we may ſee the folly of that diſpute among divines about the nature of St John's food in the wilderneſs: ſome maintaining the original word to ſignify the fruits of certain trees; others, a kind of birds, &c.: but thoſe who adhered to the literal meaning of the text were at leaſt the moſt orthodox, although their arguments were perhaps not ſo ſtrong as they might have been, had they had an opportunity of quoting ſuch authors as the above.

ACRISIUS, king of Argos (fab. hiſt.), being told by the oracle that he ſhould be killed by his grandchild, ſhut up his only daughter Danaë in a brazen tower: but Jupiter coming down in a golden ſhower, begot Perſeus upon her: after Perſeus had ſlain the Gorgons, he carried Meduſa's head to Argos; which Acriſius ſeeing, was turned into a ſtatue.

ACRITAS (anc. geog.), a promontory of Meſſenia, running into the ſea, and forming the beginning of the bay of Meſſene. Now called *Capo di Gallo*, between Methone to the weſt, and Corone to the eaſt, where the Sinus Coronæus begins.

ACROAMATIC, or ACROATIC, in general, denotes a thing ſublime, profound, or abſtruſe.

ACROAMATICI, a denomination given the diſciples or followers of Ariſtotle, &c. who were admitted into the ſecrets of the inner or acroamatic philoſophy.

ACROATIC. Ariſtotles lectures to his diſciples were of two kinds, *exoteric* and *acroatic*. The acroatic were thoſe to which only his own diſciples and intimate friends were admitted; whereas the exoteric were public, and open to all. But there are other differences. The acroatic were ſet apart for the higher and more abſtruſe ſubjects; the exoteric were employed in rhetorical and civil ſpeculations. Again, the acroatics were more ſubtile and exact, evidence and demonſtration being here aimed at; the exoterics chiefly aimed at the probable and plauſible. The former were the ſubject of the mornings exerciſes in the Lyceum, the latter of the evenings. Add, that the exoterics were publiſhed: whereas the acroatics were kept ſecret; being either entirely concealed; or, if they were publiſhed, it was in ſuch obſcure terms, that few but his own diſciples could be the wiſer for them. Hence, when Alexander complained of his preceptor for publiſhing his acroatics, and thus revealing what ſhould have been reſerved to his diſciples, Ariſtotle anſwered that they were made public and not public; for that none who had not heard them explained by the author *viva voce*, would underſtand them.

ACROATHOUM, or ACROTHOUM (anc. geog.), a town ſituated on the top of mount Athos, where the inhabitants, according to Mela, were longer lived by half than in any other country: called by the modern Greeks, Αγιον ορος; by the Italians, *La Cima di Monte Santo*.

ACROBATICA, or ACROBATICUM, from ακρος, *high*, and βατεω, or βαινω *I go*; an ancient engine, whereby

whereby people were raiſed aloft, that they might ſee more conveniently about them. The *acrobatica* among the Greeks amounted to the ſame with what they call *ſcanſorium* among the Latins. Authors are divided as to the office of this engine. Turnebus and Barbarus take it to have been of the military kind, raiſed by beſiegers, high enough to overlook the walls, and diſcover the ſtate of things on the other ſide. Baldus rather ſuppoſes it a kind of moveable ſcaffold, or cradle, contrived for raiſing painters, plaſterers, and other workmen, to the tops of houſes, trees, &c. Some ſuſpect that it might have been uſed for both purpoſes; which is the opinion of Vitruvius and Aquinas.

ACROCERAUNIA, or MONTES CERAUNII (anc. geog.), mountains running out into the ſea (ſo called from their being often thunderſtruck), ſeparating the Ionian ſea from the Adriatic; where Illyria ends and Epirus begins; now called *Monti della Chimera*.

ACROCHERISMUS, among the Greeks, a ſort of gymnaſtic exerciſe, in which the two combatants contended with their hands and fingers only, without cloſing or engaging the other parts of the body.

ACROCORINTHUS (anc. geog.), a high and ſteep hill, hanging over the city of Corinth, which was taken within the walls, as an acropolis, or citadel. On its top ſtood a temple of Venus; and lower down iſſued the fountain Pyrene.

ACROMION, in anatomy, the upper part of the ſcapula or ſhoulder-blade. See ANATOMY.

ACROMONOGRAMMATICUM, in poetry, a kind of poem, wherein every ſubſequent verſe begins with the letter wherewith the immediately preceding one terminated.

ACRON, a celebrated phyſician of Agrigentum, who firſt thought of lighting large fires, and purifying the air with perfumes, to put a ſtop to the peſtilence that ravaged Athens, and which was attended with ſucceſs. He lived about 473 years before the Chriſtian æra.

ACRON, a territory on the gold-coaſt of Guinea, in Africa, bordering on the Fantynean country. The Dutch have a fort here called Fort Patience; and under it is a village, inhabited only by fiſhermen. The other inhabitants are addicted to huſbandry, and ſell their corn to other countries. There is plenty of game, which is very commodious for the Dutch factory. The people are very ignorant, and go naked like the reſt of the negroes. This is called Little Acron; for Great Acron is farther inland, and is a kind of a republic.

ACRONICAL, ACHRONYCHAL, or ACHRONICAL, in aſtronomy, is a term applied to the riſing of a ſtar, when the ſun is ſet in the evening; but has been promiſcuouſly uſed to expreſs a ſtar's riſing at ſunſet, or ſetting at ſun-riſe.

ACRONIUS LACUS, (Mela); a ſmall lake formed by the Rhine, ſoon after its riſe out of the Alps, and after paſſing the greater lake at Conſtance, called *Venetus*, and now the *Bodengee*, or lake of Conſtance.

ACROPOLIS (anc. geog.), the citadel, and one of the diviſions of Athens; called *Polis*, becauſe conſtituting the firſt and original city; and the *Upper* Polis, to diſtinguiſh it from the Lower, which was afterwards built round it in a large open plain, the Acropolis ſtanding on a rock or eminence in the heart of this plain; and hence its name: To the north it had a wall, built by the Pelaſgi, and therefore called *Pelaſgic*; and to the ſouth a wall, by Cymon the ſon of Miltiades, out of the Perſian ſpoils, many ages after the building of the north wall. It had nine gates, and was therefore called *Enneapylon*; yet but one principal gate or entrance, the aſcent to which was by a flight of ſteps of white marble, built by Pericles with great magnificence, (Plutarch).

ACROPOLITA (George), one of the writers in the Byzantine hiſtory, was born at Conſtantinople, in the year 1220, and brought up at the court of the emperor John Ducas at Nice. He was employed in the moſt important affairs of the empire; being ſent ambaſſador to Lariſſa, to eſtabliſh a peace with Michael of Epirus; and was conſtituted judge to try Michael Comnenus, ſuſpected of engaging in a conſpiracy. Theodorus Laſcaris, the ſon of John, whom he had taught logic, appointed him governor of all the weſtern provinces in his empire. In 1255, he was taken priſoner in a war with Michael Angelus: but gaining his liberty in 1260, by means of the emperor Palæologus, he was ſent by him ambaſſador to Conſtantine, prince of Bulgaria; and was employed in ſeveral other negociations. He wrote, A Continuation of the Greek Hiſtory, from the taking of Conſtantinople by the Latins till it was recovered by Michael Palæologus in 1261, which makes part of the Byzantine hiſtory; A Treatiſe concerning Faith, Virtue, and the Soul; An Expoſition of the Sermons of St Gregory Nazianzen and other pieces. Gregory Cyprian, patriarch of Conſtantinople, in his encomium upon him, prefixed to Acropolita's hiſtory, is perhaps ſomewhat extravagant in his praiſe, when he ſays he was equal to Ariſtotle in philoſophy, and to Plato in the knowledge of divine things and Attic eloquence.

ACROSPIRE, a vulgar term for what botaniſts call the *plume*. See the article PLANTS.

ACROSPIRED, in malt-making, is the grain's ſhooting both at the root and blade end.

ACROSTIC, in poetry, a kind of poetical compoſition, diſpoſed in ſuch a manner, that the initial letters of the verſes form the name of ſome perſon, kingdom, place, motto, &c. The word is compounded of the Greek, ακρος, *extremity*, and στιχος, *verſe*. The acroſtic is conſidered by the critics as a ſpecies of falſe wit, and is therefore very little regarded by the moderns.

ACROSTICUM, RUSTYBACK, WALL-RUE, or FORK-FERN, in botany, a genus of the cryptogamia filices. The fructifications are accumulated on the whole inferior ſurface of the frond, ſo that they everywhere cover it. There are upwards of 30 ſpecies; but only three of them (according to others, two) are natives of Britain, *viz.* the ſeptentrionale, or horned fern, which grows on walls or clifts of rocks; the ilvenſe, or hairy fern, growing in clifts of rocks; and the thelyptris, or marſh fern, in tufty bogs.

ACROSTOLIUM, in ancient naval architecture, the extreme part of the ornament uſed on the prows of their ſhips, which was ſometimes in the ſhape of a buckler, helmet, animal, &c.; but more frequently circular, or ſpiral. It was uſual to tear them from the prows of vanquiſhed veſſels, and fix them to the conquerors, as a ſignal of victory.

ACROTELEUTIC, among ecclesiastic writers, an appellation given to any thing added to the end of a psalm; as the Gloria Patri, or Doxology.

ACROTERIA, in architecture, small pedestals, usually without bases, anciently placed at the middle or two extremes of pediments or frontispieces, serving to support the statues, &c. It also signifies the figures placed as ornaments on the tops of churches, and the sharp pinnacles that stand in ranges about flat buildings with rails and ballusters.

Among ancient physicians, it signified the larger extremities of the body, as the head, hands, and feet. It has also been used for the tips of the fingers, and sometimes for the eminences or processes of bones.

ACROTHYMION, from ἀκρος, *extreme*, and θυμος, *thyme*. A sort of wart described by Celsus as hard, rough, with a narrow basis and broad top; the top is of the colour of thyme, it easily splits and bleeds. This tumour is also called *thymus*.

ACT, in general, denotes the exertion of power; and differs from power, as the effect from the cause.

Act, in logic, is particularly understood of an operation of the human mind. Thus to discern and examine, are acts of the understanding; to judge and affirm, are acts of the will. There are voluntary and spontaneous acts; the former are produced by the operation of the soul, the latter without its privity or participation.

Act, in the universities, signifies a thesis maintained in public by a candidate for a degree, or to show the capacity and proficiency of a student. The candidates for a degree of bachelor and master of arts are to hold philosophical Acts; and those for bachelor of divinity, theological Acts, &c. At Oxford, the time when masters or doctors complete their degrees is also called the *act*; which is held with great solemnity. At Cambridge, they call it the *commencement*.

Act of Faith, Auto da Fe, in the Romish church, is a solemn day held by the inquisition, for the punishment of heretics, and the absolution of the innocent accused*. They usually contrive the *Auto* to fall on some great festival, that the execution may pass with the more awe and regard; at least it is always on a Sunday.

* See *Inquisition*.

The Auto da Fe may be called the last act of the inquisitorial tragedy; it is a kind of goal-delivery, appointed as oft as a competent number of prisoners in the inquisition are convicted of heresy, either by their own voluntary, or extorted confession, or on the evidence of certain witnesses. The process is thus: in the morning they are brought into a great hall, where they have certain habits put on, which they are to wear in the procession. The procession is led up by dominican friars; after which come the penitents, some with san-benitoes, and some without, according to the nature of their crimes; being all in black coats without sleeves, and bare-footed, with a wax-candle in their hands. These are followed by the penitents who have narrowly escaped being burnt, who over their black coats have flames painted with their points turned downwards, *Fuego revolto*. Next come the negative, and relapsed, who are to be burnt, having flames on their habits pointing upwards. After these come such as profess doctrines contrary to the faith of Rome, who, besides flames pointing upwards, have their picture painted on their breasts, with dogs, serpents, and devils, all open-mouthed, about it. Each prisoner is attended with a familiar of the inquisition; and those to be burnt have also a Jesuit on each hand, who are continually preaching to them to abjure. After the prisoners, comes a troop of familiars on horseback; and after them the inquisitors, and other officers of the court, on mules; last of all, the inquisitor-general on a white horse, led by two men with black hats and green hat bands. A scaffold is erected in the *Terriero de Paio*, big enough for two or three thousand people; at one end of which are the prisoners, at the other the inquisitors. After a sermon made up of encomiums on the inquisition, and invectives against heretics, a priest ascends a desk near the middle of the scaffold, and having taken the abjuration of the penitents, recites the final sentence of those who are to be put to death; and delivers them to the secular arm, earnestly beseeching at the same time the secular power not to touch their blood, or put their lives in danger. The prisoners being thus in the hands of the civil magistrate, are presently loaded with chains, and carried first to the secular goal, and from thence in an hour or two brought before the civil judge; who, after asking in what religion they intend to die, pronounces sentence, on such as declare they die in the communion of the church of Rome, that they shall be first strangled, and then burnt to ashes; on such as die in any other faith, that they be burnt alive. Both are immediately carried to the Ribera, the place of execution; where there are as many stakes set up as there are prisoners to be burnt, with a quantity of dry furz about them. The stakes of the professed, that is, such as persist in their heresy, are about four yards high, having a small board towards the top for the prisoner to be seated on. The negative and relapsed being first strangled and burnt, the professed mount their stakes by a ladder; and the Jesuits, after several repeated exhortations to be reconciled to the church, part with them, telling them they leave them to the devil, who is standing at their elbow to receive their souls, and carry them with him into the flames of hell. On this a great shout is raised; and the cry is, Let the dogs *beards be made*; which is done by thrusting flaming furzes fastened to long poles against their faces, till their faces are burnt to a coal, which is accompanied with the loudest acclamations of joy. At last, fire is set to the furz at the bottom of the stake, over which the professed are chained so high, that the top of the flame seldom reaches higher than the seat they sit on; so that they rather seem roasted than burnt. There cannot be a more lamentable spectacle; the sufferers continually cry out while they are able, *Misericordia por amor de Dios*, "Pity for the love of God!" yet it is beheld by all sexes, and ages, with transports of joy and satisfaction.

Act, in dramatic poetry, signifies a certain division, or part, of a play, designed to give some respite both to the actors and spectators. The Romans were the first who divided their theatrical pieces into acts; for no such divisions appear in the works of the first dramatic poets. Their pieces indeed consisted of several parts or divisions, which they called *protasis*, *epitasis*, *catastasis*, and *catastrophe*; but these divisions were not marked by any real interruptions on the theatre. Nor does Aristotle mention any thing of acts in his Art of Poetry. But, in the time of Horace, all regular and finished pieces were divided into five acts.

Neuve minor, neu sit quinto productior actu
Fabula, quæ posci vult & spectata reponi.

The first act, according to some critics, besides introducing upon the stage the principal characters of the play, ought to propose the argument or subject of the piece; the second, to exhibit this to the audience, by carrying the fable into execution; the third, to raise obstacles and difficulties: the fourth, to remove these, or raise new ones in the attempt; and the fifth, to conclude the piece, by introducing some accident that may unravel the whole affair. This division, however, is not essentially necessary; but may be varied according to the humour of the author, or the nature of the subject. See POETRY, Part II. Sect. i.

Act of Grace. See GRACE.

ACT, among lawyers, is an instrument in writing for declaring or justifying the truth of any thing. In which sense, records, decrees, sentences, reports, certificates, &c. are called *acts*.

ACTS, also denote the deliberations and resolutions of an assembly, senate, or convention; as acts of parliament, &c. Likewise matters of fact transmitted to posterity in certain authentic books and memoirs.

ACTA Consistorii, the edicts or declarations of the council of state of the emperors. These edicts were generally expressed in such terms as these: "The august emperors, *Dioclesian* and *Maximian*, in council declared, That the children of Decurions should not be exposed to wild beasts in the amphitheatre."

The senate and soldiers often swore, either through abject flattery or by compulsion, upon the *edicts* of the emperor, as we do upon the *bible*. And the name of *Apidius Merula* was erased by Nero out of the register of senators, because he refused to swear upon the edicts of the emperor Augustus.

ACTA Diurna, was a sort of Roman gazette, containing an authorized narrative of the transactions worthy of notice which happened at Rome. Petronius has given us a specimen of the *acta diurna* in his account of Trimalchis; and as it may not perhaps be unentertaining to see how exactly a Roman newspaper runs in the style of an American one, the following is an article or two out of it:

"On the 26th of July, 30 boys and 40 girls were born at Trimalchi's estate at Cuma.

"At the same time a slave was put to death for uttering disrespectful words against his lord.

"The same day a fire broke out in Pompey's gardens, which began in the night, in the steward's apartment."

ACTA Populi, among the Romans, were journals or registers of the daily occurrences; as assemblies, trials, executions, buildings, births, marriages, deaths, &c. of illustrious persons, and the like. These were otherwise called *Acta Publica*, and *Acta Diurna*, or simply *Acta*. The *Acta* differed from Annals, in that only the greater and more important matters were in the latter, and those of less note were in the former. Their origin is attributed to Julius Cæsar, who first ordered the keeping and making public the acts of the people. Some trace them higher, to Servius Tullius; who, to discover the number of persons born, dead, and alive, ordered that the next of kin, upon a birth, should put a certain piece of money into the treasury of Juno Lucina; upon a death, into that of Venus Libitina: the like was also to be done upon assuming the toga virilis, &c. Under Marcus Antoninus, this was carried further: persons were obliged to notify the births of their children, with their names and surnames, the day, consul, and whether legitimate or spurious, to the præfects of the *Ærarium Saturni*, to be entered in the public acts; though before this time the births of persons of quality appear thus to have been registered.

ACTA Senatus, among the Romans, were minutes of what passed and was debated in the senate-house. These were also called *Commentarii*, and by a Greek name υπομνηματα. They had their origin in the consulship of Julius Cæsar, who ordered them both to be kept and published. The keeping them was continued under Augustus, but the publication was abrogated. Afterwards all writings, relating to the decrees or sentences of the judges, or what passed and was done before them, or by their authority, in any cause, were also called by the name *Acta*: In which sense we read of civil acts, criminal acts, intervenient acts; *acta civilia, criminalia, intervenientia*, &c.

Public ACTS. The knowledge of public acts forms part of a peculiar science, called the DIPLOMATIC, of great importance to an historian, statesman, chronologer, and even critic. The preservation of them was the first occasion of erecting libraries. The style of acts is generally barbarous Latin. Authors are divided as to the rules of judging of their genuineness, and even whether there be any certain rule at all. F. Germon will have the greater part of the acts of former ages to be spurious. Fontanini asserts, that the number of forged acts now extant is very small. It is certain there were severe punishments inflicted on the forgers and falsifiers of acts.—The chief of the English acts, or public records, are published by Rymer, under the title of *Fœdera*, and continued by Saunderson; an extract whereof has been given in French by Rapin, and translated into English under the title of *Acta Regia*. Great commendations have been given this work: also some exceptions made to it; as that there are many spurious acts, as well as errors, in it; some have even charged it with falsifications.—The public acts of France fell into the hands of the English after the battle of Poitiers, and are commonly said to have been carried by them out of the country. But the tradition is not supported by any sufficient testimony.

ACTS of the Apostles, one of the sacred books of the New Testament, containing the history of the infant-church, during the space of 29 or 30 years from the ascension of our Lord to the year of Christ 63.—It was written by St Luke; and addressed to Theophilus, the person to whom the evangelist had before dedicated his gospel. We here find the accomplishment of several of the promises made by our Saviour; his ascension; the descent of the Holy Ghost; the first preaching of the apostles, and the miracles whereby their doctrines were confirmed; an admirable picture of the manners of the primitive Christians; and, in short, every thing that passed in the church till the dispersion of the apostles, who separated themselves in order to propagate the gospel throughout the world. From the period of that separation, St Luke quits the history of the other apostles, who were then at too great a distance from him, and confines himself more particularly to that of St Paul, who had chosen him for the companion of his labours. He follows that apostle in all his missions, and

Acts.

and even Rome itself; for it appears that the Acts were published in the second year of St Pauls's residence in that city, or the 36th year of the Christian æra, and in the 9th or 10th year of Nero's reign. The style of this work, which was originally composed in Greek, is much purer than that of the other canonical writers; and it is observable, that St Luke, who was much better acquainted with the Greek than with the Hebrew language, always, in his quotations from the Old Testament, makes use of the Septuagint version. The council of Laodicea places the Acts of the Apostles among the canonical books, and all the churches have acknowledged it as such without any controversy.

There were several *Spurious* Acts of the Apostles; particularly, I. *Acts*, supposed to be written by Abdias*, the pretended bishop of Babylon, who gave out that he was ordained bishop by the Apostles themselves when they were upon their journey into Persia. II. *The Acts of St Peter*: this book came originally from the school of the Ebionites. III. *The Acts of St Paul*, which is entirely lost. Eusebius, who had seen it, pronounces it of no authority. IV. *The Acts of St John the Evangelist*; a book made use of by the Encratites, Manichæans, and Priscillianists. V. *The Acts of St Andrew*; received by the Manicheæns, Encratites, an Apotactics. VI. *The Acts of St Thomas the Apostle*; received particularly by the Manichæans. VII. *The Acts of St Philip*. This book the Gnostics made use of. VIII. *The Acts of St Matthias*. Some have imagined that the Jews for a long time had concealed the original acts of the life and death of St Matthias written in Hebrew; and that a monk of the abbey of St Matthias at Treves, having got them out of their hands, procured them to be translated into Latin, and published them; but the critics will not allow them to be authentic.

*See *Abdias*

Acts of Pilate; a relation sent by Pilate to the emperor Tiberius, concerning Jesus Christ, his death, resurrection, ascension, and the crimes of which he was convicted before him†. It was a custom among the Romans, that the proconsuls and governors of provinces should draw up acts or memoirs, of what happened in the course of their government, and send them to the emperor and senate. The genuine *acts* of Pilate were sent by him to Tiberius, who reported them to the senate; but they were rejected by that assembly, because not immediately addressed to them: as is testified by Tertullian, in his Apol. cap. 5. and 20, 21. The heretics forged acts in imitation of them: in the reign of the emperor Maximin, the Gentiles, to throw an odium on the Christian name, spread about spurious Acts of Pilate; which the emperor, by a solemn edict, ordered to be sent into all the provinces of the empire, and enjoined the school-masters to teach and explain them to their scholars, and make them learn them by heart. These acts, both the genuine and the spurious, are lost. There is indeed extant, in the Pseudo-Hegesippas, a letter from Pilate to the emperor Claudius, concerning Jesus Christ‡; but it discovers itself at first sight not to be authentic.

† Eseub. ii. *Hist Eccles.* lib. ii. cap. 2. and ix. 5.

‡ Cave *Hist. Literar. Sac. Apostol.*

Act of Parliament of Great Britan, is a positive law, consisting of two parts, the words of the act, and its true sense and meaning; which being joined, make the law. The words of acts of parliament should be taken in a lawful sense. Cases of the same nature are within the intention, though without the letter, of the act; and some acts extend by equity to things not mentioned therein. See Parliament.

Actæ, Actæa.

ACTÆ, were meadows of remarkable verdure and luxuriancy near the sea-shore, where the Romans used to indulge themselves to a great degree in softness and delicacy of living. The word is used in this sense by Cicero and Virgil; but Vossius thinks it can only be used in speaking of Sicily, as these two authors did.

ACTÆA, Aconitum Racemosum, Herb Christopher, or Bane-berries; a genus of the monogynia order, belonging to the polyandria class of plants. The characters are: the *calyx* is a perianthium consisting of four roundish, obtuse, concave leaves, which fall off. The *corolla* consists of four petals, larger than the calyx, pointed at both ends, and falling off. The *stamina* consist of numerous capillary filaments; the antheræ are roundish, erect, and didymous. The *pistillum* has an ovate germen; no stylus; the stigma thickish and obliquely depressed. The *pericarpium* is an oval smooth one-furrow'd one-cell'd berry. The seeds are very numerous, semiorbicular, and incumbent in a double order.—This genus is associated with the *Multisiliquæ*, the 26th natural order. There are four

Species and properties. 1. The spicata, or common herb-christopher, is a native in several parts of Britain. It grows to the height of about two feet and a half; the foot-stalks of the leaves arise from the root; these divide into three smaller foot-stalks, each of which are again divided into three, and these have each three lobes, so that each leaf is composed of 27 lobes or smaller leaves. The flowers grow in ramous spikes, and are of a pure white: they are borne upon a slender, jointed, and furrowed stem; appear in May; and are succeeded by black, shining, pulpy berries, about the size of peas, which ripen in the autumn. This plant is a powerful repellent, and the root has been used internally in some nervous cases, but must be administered with caution. The berries are highly poisonous. It is said toads resort to this plant, on account of its fetid smell. Sheep and goats eat it; cows, horses, and swine refuse it. 2. The alba, or American herb-christopher, is a native of North America. The leaves of this species are somewhat like the former, but not so deeply indented in the edges. The flowers grow in a more compact spike, and the berries are very white and transparent when ripe; the roots are composed of thick knobs. This species has been used as an emetic, and sometimes called *ipecacoanha*. 3. The racemosa, or American black or wild snakeroot, is likewise a native of North-America. It has large compound leaves, rising immediately from the root, and branched after the same manner as the first which grow more than two feet high. The flower-stem rises to the height of four or five feet; and carries a long spike of white flowers reflected at the top. These appear in June or the beginning of July, but the seeds do not come to maturity in Britain. The root of this plant is greatly used by physicians in this country, in many disorders; and is supposed to be an antidote against poison, or the biting of a rattle-snake. 4. The cimicifuga, is a native of Siberia; the leaves resemble those of the feathered columbine; the stalks rise little more than a foot high, supporting particles of white flowers, which appear in May. This species is rare in Britain.

Culture. The first species hath a perennial root, but the stalks annually decay. It may be propagated either by seeds, or parting the roots, which should be transplanted in autumn. The seeds should be sown soon after they are ripe, or they will lie a whole year in the ground before they vegetate. They should be sown in a shady border: and as all the plants do not come up at the same time, the border should not be disturbed till the following autumn, when they should be transplanted into a shady border, where they may be allowed to remain and flower.—The second species may be propagated in the same manner: only the plants should be allowed three feet every way, on account of their wide-spreading leaves. This species delights in a light moist soil, and shady situation.—The third is usually propagated by seeds sent annually from North America: it thrives in the same kind of soil as the former; and is very hardy, requiring no other culture than the common flowering-shrubs. The plants should not be often removed for that will prevent their flowering strong.—The fourth requires a moist loamy soil, and shady situation. It may be propagated in the same manner as the others.

ACTÆON, in fabulous history, the son of Aristæus and Autonoe; a great hunter. He was turned by Diana into a stag, for looking on her while bathing; and died by his own dogs.

ACTANIA, an island, according to Pliny, in the North sea. It lies to the west of Holstein and Ditmersch, not far from the mouth of the Eyder and Elbe, and is now called *Heyligland.*

ACTE. See SAMBUCUS.

ACTIAN GAMES, in Roman antiquity, were solemn games instituted by Augustus, in memory of his victory over Marc Anthony at Actium, held every fifth year, and celebrated in honour of Apollo, since called *Actius*. Hence *Actian* Years, an æra commencing from the battle of Actium, called the *Æra of Augustus.*

Virgil insinuates them to have been instituted by Æneas; from that passage Æn. III. v. 280.

Actiaque Iliacis celebramus litora ludis.

Æn. iii. 280.

But this he only does by way of compliment to Augustus; attributing that to the hero from whom he descended, which was done by the emperor himself: as is observed by Servius.

ACTINIA, in zoology, a genus belonging to the order of vermes mollusca. The body is oblong and smooth, attaching itself firmly by its basis to rocks or other solid substances, having a dilatable apex hooked within. The mouth is furnished with crooked teeth, the rostrum cylindrical and radiated. There are five species, some of which make a beautiful appearance, and are called *Animal Flowers, Sea Anemonies,* and *Urtica Marina.* See ANIMAL *Flower.*

Progressive motion in these creatures is so slow, that it is difficult to perceive any, as they scarce advance the length of one inch in an hour. It would seem they do not all produce, when handled, the painful sensation which had acquired them the name of *sea-nettles*— They are viviparous, feed on shell fish, open their mouth more or less according to the size of the prey they have to deal with, and then reject the shell through the same aperture. When the mouth is open, all the tentacula of the actinia may be seen, resembling in that situation a full-blown flower, which has given it the denomination of the *flower fish.*

ACTIO, in Roman antiquities, an action at law in a court of justice. The formalities used by the Romans, in judicial actions, were these: If the difference failed to be made up by friends, the injured persons proceeded *in jus reum vocare,* to summon the offending party to the court, who was obliged to go and give bond for his appearance.

The offending party might be summoned into court *viva voce,* by the plaintiff himself meeting the defendant, declaring his intention to him, and commanding him to go before the magistrate and make his defence. If he would not go willingly, he might drag and force him along, unless he gave security for his appearance on some appointed day. If he failed to appear on the day agreed on, then the plaintiff, whensoever he met him, might take him along with him by force, calling any by-standers to bear witness, by asking them *visne antestari*; the by-standers upon this turned their ear towards him in token of their consent: To this Horace alludes in his Sat. against the impertinent, Lib. I. Sat. 9. See this further explained under the article ANTESTARI.

Both parties being met before the prætor, or other supreme magistrate presiding in the court, the plaintiff proposed the action to the defendant; in which he designed to prosecute him. This they termed *edere actionem*; and was commonly performed by writing it in a tablet, and offering it to the defendant, that he might see whether he had better stand the suit or compound.

In the next place came the *postulatio actionis*, or the plantiff's petition to the prætor, for leave to prosecute the defendant in such an action. The petition was granted by writing at the bottom of it *actionem do,* or refused by writing in the same manner *actionem non do.*

The petition being granted, the plantiff *vadabatur reum,* i. e. obliged him to give sureties for his appearance on such a day in the court; and this was all that was done in public, before the day fixed upon for the trial.

In the mean time, the difference was often made up, either *transactione,* by letting the cause fall as dubious; or *pactione,* by composition for damages amongst friends.

On the day appointed for hearing, the prætor ordered the several bills to be read, and the parties summoned by an *accensus*, or beadle. See ACCENSI.

Upon the non-appearance of either party, the defaulter lost his cause;—if they both appeared, they were said *se stetisse*; and the the plaintiff proceeded *litem sive actionem intendere,* i. e. to prefer his suit, which was done in a set form of words, varying according to the difference of the actions. After this the plaintiff desired judgment of the prætor, that is, to be allowed a *judex* or *arbiter*, or else the *recuperatores* or *centumviri.* These he requested for the hearing and deciding the business; but none of them could be desired but by the consent of both parties.

The prætor having assigned them their judges, defined and determined the number of witnesses to be admitted, to hinder the protracting of the suit; and then the parties proceeded to give their caution, that

the

Action. the judgment, whatever it was, should stand and be performed on both sides. The judges took a solemn oath to be impartial; and the parties took the *juramentum calumniæ*. Then the trial began with the assistance of witnesses, writings, &c. which was called *disceptatio causæ*.

ACTION, in a general sense, implies nearly the same thing with ACT.—Grammarians, however, observe some distinction between *action* and *act*; the former being generally restricted to the common or ordinary transactions, whereas the latter is used to express those which are remarkable. Thus, we say it is a good *action* to comfort the unhappy; it is a generous *act* to deprive ourselves of what is necessary for their sake. The wise man proposes to himself an honest end in all his *actions*; a prince ought to mark every day of his life with some *act* of greatness. The abbé Girard makes a further distinction between the words *action* and *act*. The former, according to him, has more relation to the power that acts than the latter; whereas the latter has more relation to the effect produced than the former: and hence the one is properly the attribute of the other. Thus we may properly say, "Be sure to preserve a presence of mind in all your actions; and take care that they all be acts of equity."

ACTION, in mechanics, implies either the effort which a body or power makes against another body or power, or the effect itself of that effort.

As it is necessary in works of this kind to have a particular regard to the common language of mechanics and philosophers, we have given this double definition: but the proper signification of the term is the motion which a body really produces, or tends to produce, in another; that is, such is the motion it would have produced, had nothing hindered its effect.

All power is nothing more than a body actually in motion, or which tends to move itself; that is, a body which would move itself if nothing opposed it. The action therefore of a body is rendered evident to us by its motion only; and consequently we must not fix any other idea to the word action, than that of actual motion, or a simple tendency to motion. The famous question relating to *vis viva*, and *vis mortua*, owes, in all probability, its existence to an inadequate idea of the word action; for had Leibnitz and his followers observed, that the only precise and distinct idea we can give to the word force or action, reduces it to its effect, that is, to the motion it actually produces or tends to produce, they would never have made that curious distinction.

Quantity of ACTION, a name given by M. de Maupertuis, in the Memoirs of the Parisian Academy of Sciences for 1744, and those of Berlin for 1746, to the product of the mass of a body by the space which it runs through, and by its celerity. He lays it down as a general law, "that, in the changes made in the "state of a body, the quantity of action necessary to pro- "duce such a change, is the least possible." This principle he applies to the investigation of the laws of refraction, of equilibrium, &c. and even to the ways of acting employed by the Supreme Being. In this manner M. de Maupertuis attempts to connect the metaphysics of final causes with the fundamendal truths of mechanics, to show the dependence of the collision of both elastic and hard bodies upon one and the same law, which before had always been referred to separate laws; and to reduce the laws of motion, and those of equilibrium, to one and the same principle.

ACTION, in ethics, denotes the external signs or expressions of the sentiments of a moral agent. See *Active Power, infra*.

ACTION, in poetry, the same with subject or fable. Critics generally distinguish two kinds, the principal and the incidental. The principal action is what is generally called the *fable*; and the incidental an *episode*. See POETRY, Part II.

ACTION, in oratory, is the outward deportment of the orator, or the accommodation of his countenance, voice, and gesture, to the subject of which he is treating. See ORATORY, Part IV.

ACTION, in a theatrical sense. See DECLAMATION, Art. IV.

ACTION for the Pulpit. See DECLAMATION, Art. I.

ACTION, in painting and sculpture, is the attitude or position of the several parts of the face, body, and limbs of such figures as are represented, and whereby they seem to be really actuated by passions. Thus we say, the action of such a figure finely expresses the passions with which it is agitated: we also use the same expression with regard to animals.

ACTION, in physiology, is applied to the functions of the body, whether vital, animal, or natural.

The *vital* functions, or actions, are those which are absolutely necessary to life, and without which there is no life, as the action of the heart, lungs, and arteries. On the action and reaction of the solids and fluids on each other, depend the vital functions. The pulse and respiration are the external signs of life. Vital diseases are all those which hinder the influx of the venous blood into the cavities of the heart, and the expulsion of the arterial blood from the same.—The *natural* functions are those which are instrumental in repairing the several losses which the body sustains; for life is destructive of itself, its very offices occasioning a perpetual waste. The manducation of food, the deglutition and digestion thereof, also the separation and distribution of the chyle and excrementitous parts, &c. are under the head of natural functions, as by these our aliment is converted into our nature. They are necessary to the continuance of our bodies.—The *animal* functions are those which we perform at will, as muscular motion, and all the voluntary actions of the body, they are those which constitute the senses of touch, taste, smell, sight, hearing; perception, reasoning, imagination, memory, judgment, affections of the mind. Without any, or all of them, a man may live, but not so comfortably as with them.

ACTION, in commerce, is a term used abroad for a certain part or share of a public company's capital stock. Thus if a company has 400,000 livres capital stock, this may be divided into 400 actions, each consisting of 1000 livres. Hence a man is said to have two, four, &c. actions, according as he has the property of two, four, &c. 1000 livres capital stock. The transferring of actions abroad is performed much in the same manner as stocks are in England. See STOCKS.

ACTION, in law, is a demand made before a judge for obtaining what we are legally intitled to demand, and is more commonly known by the name of *law-suit* or *process*. See SUIT.

ACTIONARY,

ACTIONARY, or ACTIONIST, a proprietor of stock in a trading company.

ACTIONS, among merchants, sometimes signify moveable effects; and we say the merchant's creditors have seized on all his actions, when we mean that they have taken possession of all his active debts.

ACTIVE, denotes something that communicates action or motion to another; in which acceptation it stands opposed to passive.

ACTIVE, in grammar, is applied to such words as express action; and is therefore opposed to passive. The active performs the action, as the passive receives it. Thus we say, a verb *active*, a conjugation *active*, &c. or an *active* participle.

ACTIVE Verbs, are such as do not only signify doing, or acting; but have also nouns following them, to be the subject of the action or impression: thus, *To love, to teach*, are verbs *active*; because we can say, *To love a thing, to teach a man*. Neuter verbs also denote an action, but are distingnished from active verbs, in that they cannot have a noun following them: such are *To sleep, to go, &c.*—Some grammarians, however, make three kinds of active verbs: the *transactive*, where the action passes into a subject different from the agent: *reflected*, where the action returns upon the agent; and *reciprocal*, where the action turns mutually upon the two agents who produced it.

ACTIVE Power, in metaphysics, the power of executing any work or labour: in contradistinction to *speculative* powers*, or the powers of seeing, hearing, remembering, judging reasoning, &c

*Dr Reid *on the Active Powers of Man*, p. 12.

The exertion of active power we call *action*; and as every action produces some change, so every change must be caused by some effect, or by the cessation of some exertion of power. That which produces a change by the exertion of its power, we call the *cause* of that change; and the change produced, the *effect* of that cause. See METAPHYSICS.

ACTIVE Principles, in chemistry, such as are supposed to act without any assistance from others; as mercury, sulphur, &c.

ACTIVITY, in general, denotes the power of acting, or the active faculty. See ACTIVE.

Sphere of ACTIVITY, the whole space in which the virtue, power, or influence, of any object, is exerted.

ACTIUM (anc. geog.), a town situated on the coast of Acarnania, in itself inconsiderable, but famous for a temple of Apollo, a safe harbour, and an adjoining promontory of the same name, in the mouth of the Sinus Ambracius, over against Nicopolis, on the other side of the bay: it afterwards became more famous on account of Augustus's victory over Anthony and Cleopatra; and for quinquennial games instituted there, called *Actia* or *Ludi Actiaci*. Hence the epithet *Actius*, given to Apollo (Virgil). *Actiaca æra*, a computation of time from the battle of Actium. The promontory is now called *Capo di Figalo*.

ACTIUS, in mythology, a surname of Apollo, from Actium, where he was worshipped.

ACTON, a town near London, where is a well that affords a purging water, which is noted for the pungency of its salt. This water is whitish, to the taste it is sweetish, with a mixture of the same bitter which is in the Epsom water. The salt of this water is not quite so soft as that of Epsom; and is more calcareous than it, being more of the nature of the salt of lime: for a quantity of the Acton water being boiled high, on being mixed with a solution of sublimate in pure water, threw down a yellow sediment. The salt of the Acton water is more nitrous than that of Epsom; it strikes a deep red, or purple, with the tincture of logwood in brandy, as is usual with nitrous salts; it does not precipitate silver out of the spirit of nitre, as common salt does: 1¼ ℔ of this water yields 48 grains of salt.

ACTOR, in general, signifies a person who acts or performs something.

ACTOR, among Civilians, the proctor or advocate in civil courts or causes: as, *Actor ecclesiæ* has been sometimes used for the advocate of the church; *actor dominicus* for the lord's attorney; *actor villæ*, the steward or head bailiff of a village.

ACTOR, in the drama, is a person who represents some part or character upon the theatre. The drama consisted originally of nothing more than a simple chorus, who sung hymns in honour of Bacchus; so that the primitive actors were only singers and musicians. Thespis was the first that, in order to ease this unformed chorus, introduced a declaimer, who repeated some heroic or comic adventure. Æschylus, finding a single person tiresome, attempted to introduce a second, and changed the ancient recitals into dialogues. He also dressed his actors in a more majestic manner, and introduced the cothurnus or buskin. Sophocles added a third, in order to represent the various incidents in a more natural manner: and here the Greeks stopped, at least we do not find in any of their tragedies above three persons in the same scene. Perhaps they looked upon it as a rule of the dramatic poem, never to admit more than three speakers at a time on the stage; a rule which Horace has expressed in the following verse:

Nec quarta loqui persona laboret.

This, however, does not prevent their increasing the number of actors in comedy. Before the opening of a play, they named their actors in full theatre, together with the parts they were to perform. The ancient actors were masked, and obliged to raise their voice extremely, in order to make themselves heard by the innumerable crowd of people who filled the amphitheatres: they were accompanied with a player on the flute, who played a prelude, gave them the tone, and played while they declaimed. Horace speaks of a kind of secondary actors, in his time, whose business was to imitate the first; and lessen themselves, to become better foils to their principals.

The moderns have introduced an infinite number of actors upon the stage. This heightens the trouble and distress that should reign there, and makes a diversity, in which the spectator is sure to be interested.

Actors were highly honoured at Athens. At Rome they were despised, and not only denyed all rank among the citizens, but even when any citizen appeared upon the stage he was expelled his tribe and deprived of the right of suffrage by censors. Cicero, indeed, esteems the talents of Roscius: but he values his virtues still more; virtues which distinguished him so remarkably above all others of his profession, that they seemed to have excluded him from the theatre. The French have, in this respect, adopted the ideas of the Romans; and the English those of the Greeks.

ACTOR, the name of several persons in fabulous history

ſtory. One *Actor* among the Aurunci is deſcribed by Virgil as an hero of the firſt rank. *Æn.* xii.

ACTORUM TABULÆ, in antiquity, were tables inſtituted by Servius Tullius, in which the births of children were regiſtered. They were kept in the treaſury of Saturnus.

ACTRESS, in a general ſenſe, a female who acts or performs ſomething.

ACTRESS, in the drama, a female performer. Women actors were unknown to the ancients, among whom men always performed the female character; and hence one reaſon for the uſe of maſks among them.

Actreſſes are ſaid not to have been introduced on the Engliſh ſtage till after the reſtoration of king Charles II. who has been charged with contributing to the corruption of manners by importing this uſage from abroad. But this can be but partly true: the queen of James I. acted a part in a paſtoral; and Prynn, in his Hiſtriomaſtix, ſpeaks of women actors in his time as whores; which was one occaſion of the ſevere proſecution brought againſt him for that book.

There are ſome very agreeable and beautiful talents, of which the poſſeſſion commands a certain ſort of admiration; but of which the exerciſe for the ſake of gain is conſidered, whether from reaſon or prejudice, as a ſort of public proſtitution. The pecuniary recompence, therefore, of thoſe who exerciſe them in this manner, muſt be ſufficient, not only to pay for the time, labour, and expence of acquiring the talents, but for the diſcredit which attends the employment of them as the means of ſubſiſtence. The exorbitant rewards of players, opera-ſingers, opera-dancers, &c. are founded upon thoſe two principles; the rarity and beauty of the talents, and the diſcredit of employing them in this manner. It ſeems abſurd at firſt ſight that we ſhould deſpiſe their perſons, and yet reward their talents with the moſt profuſe liberality. While we do the one, however, we muſt of neceſſity do the other. Should the public opinion or prejudice ever alter with regard to ſuch occupations, their pecuniary recompence would quickly diminiſh. More people would apply to them, and the competition would quickly reduce the price of their labour. Such talents, though far from being common, are by no means ſo rare as is imagined. Many people poſſeſs them in great perfection, who diſdain to make this uſe of them; and many more are capable of acquiring them, if any thing could be made honourably by them.

ACTUAL, ſomething that is real and effective, or that exiſts truly and abſolutely. Thus philoſophers uſe the terms *actual* heat, *actual* cold, &c. in oppoſition to *virtual* or *potential*. Hence, among phyſicians, a red-hot iron, or fire, is called an *actual* cautery; in diſtinction from cauteries, or cauſtics, that have the power of producing the ſame effect upon the animal ſolids as actual fire, and are called *potential* cauteries. Boiling water is actually hot; brandy, producing heat in the body, is potentially hot, though of itſelf cold.

Actual Sin, that which is committed by the perſon himſelf, in oppoſition to *original* ſin, or that which he contracted from being a child of Adam.

ACTUARIÆ NAVES, a kind of ſhips among the Romans, chiefly deſigned for ſwift ſailing.

ACTUARIUS, a celebrated Greek phyſician, of the 13^{th} century, and the firſt Greek author who has treated of mild purgatives, ſuch as caſſia, manna, ſena, &c. His works were printed in one volume folio, by Henry Stephens, in 1567.

ACTUARIUS, or ACTARIUS, a notary or officer appointed to write the acts or proceedings of a court, or the like. In the Eaſtern Empire, the actuarii were properly officers who kept the military accounts, received the corn from the *ſuſceptores* or ſtore-keepers, and delivered it to the ſoldiers.

ACTUATE, to bring into act, or put a thing in action. Thus an agent is ſaid, by the ſchoolmen, to *actuate* a power, when it produces an act in a ſubject. And thus the mind may be ſaid to *actuate* the body.

ACTUS, in ancient architecture, a meaſure in length equal to 120 Roman feet. In ancient agriculture, the word ſignified the length of one furrow or the diſtance a plough goes before it turns.

Actus Minimus, was a quantity of land 120 feet in length, and four in breadth.

Actus Major, or *Actus Quadratus*, a piece of ground in a ſquare form, whoſe ſide was equal to 120 feet, equal to half the jugerum.

Actus Intervicenalis, a ſpace of ground four feet in breadth, left between the lands as a path or way.

ACUANITES, in eccleſiaſtical hiſtory, the ſame with thoſe called more frequently MANICHEES. They took the name from Acua, a diſciple of Thomas one of the twelve apoſtles.

ACULEATE, or ACULEATI, a term applied to any plant or animal armed with prickles.

ACULEI, the prickles of animals or of plants.

ACULER, in the manege, is uſed for the motion of a horſe, when, in working upon volts, he does not go far enough forward at every time or motion, ſo that his ſhoulders embrace or take in too little ground, and his croupe comes too near the centre of the volt. Horſes are naturally inclined to this fault in making demi-volts.

ACUMINA, in antiquity, a kind of military omen, moſt generally ſuppoſed to have been taken from the points or edges of darts, ſwords, or other weapons.

ACUNA (Chriſtopher de), a Spaniſh Jeſuit, born at Burgos. He was admitted into the ſociety in 1612, being then but 15 years of age. After having devoted ſome years to ſtudy, he went to America, where he aſſiſted in making converts in Chili and Peru. In 1640, he returned to Spain, and gave the king an account how far he had ſucceeded in the commiſſion he had received to make diſcoveries on the river of the Amazons; and the year following he publiſhed a deſcription of this river, at Madrid. Acuna was ſent to Rome, as procurator of his province. He returned to Spain with the title of Qualificator of the Inquiſition; but ſoon after embarked again for the Weſt Indies, and was at Lima in 1675, when father Southwell publiſhed at Rome the Bibliotheque of the Jeſuit writers. Acuna's work is intitled, *Nuevo deſcubrimento del gran rio de las Amazonas*; *i. e.* "a new diſcovery of the great river of the Amazons." He was ten months together upon this river, having had inſtructions to inquire into every thing with the greateſt exactneſs, that his majeſty might thereby be enabled to render the navigation more

more eaſy and commodious. He went aboard a ſhip at Quito with Peter Texiera, who had already been ſo far up the river, and was therefore thought a proper perſon to accompany him in this expedition. They embarked in February 1639, but did not arrive at Para till the December following. It is thought that the revolutions of Portugal, by which the Spaniards loſt all Braſil, and the colony of Para at the mouth of the river of the Amazons, were the cauſe that the relation of this Jeſuit was ſuppreſſed; for as it could not be of any advantage to the Spaniards, they were afraid it might prove of great ſervice to the Portugueſe. The copies of this work became extremely ſcarce, ſo that the publiſhers of the French tranſlation at Paris aſſerted, that there was not one copy of the original extant, excepting one in the poſſeſſion of the tranſlator, and, perhaps, that in the Vatican library. M. de Gomberville was the author of this tranſlation: it was publiſhed after his death, with a long diſſertion. An account of the original may be ſeen in the Paris Journal, in that of Leipſic, and in Chevereau's Hiſtory of the world.

ACUPUNCTURE, the name of a ſurgical operation among the Chineſe and Japaneſe, which is performed by pricking the part affected with a ſilver needle. They employ this operation in headachs, lethargies, convulſions, colics, &c.

ACUS, in ichthyology, the trivial name of a ſpecies of ſyngathus. See SYNGATHUS.

ACUSIO COLONIA, now ANCONE, according to Holſtenius, between Orange and Valence, near Montelimart, on the banks of the Rhone.

ACUTE, an epithet applied to ſuch things as terminate in a ſharp point or edge. And in this ſenſe it ſtands oppoſed to obtuſe.

ACUTE Angle, in geometry, is that which is leſs than a right angle, or which does not ſubtend 90 degrees.

ACUTE-angled Triangle, is a triangle whoſe three angles are all acute.

ACUTE-angled Cone is, according to the ancients, a right cone, whoſe axis makes an acute angle with its ſide.

ACUTE, in muſic, is applied to a ſound or tone that is ſharp or high, in compariſon of ſome other tone. In this ſenſe, *acute* ſtands oppoſed to *grave*.

ACUTE Accent. See ACCENT.

ACUTE Diſeaſes, ſuch as come ſuddenly to a criſis. This term is uſed for all diſeaſes which do not fall under the head of chronic diſeaſes.

ACUTIATOR, in writers of the barbarous ages, denotes a perſon that whets or grinds cutting inſtruments; called alſo in ancient gloſſaries, *acutor*, ακονητης, *ſamiarius*, *coharius*, &c. In the ancient armies there were acutiators, a kind of ſmiths, retained for whetting or keeping the arms ſharp.

AD, a Latin prepoſition, originally ſignifying *to*, and frequently uſed in compoſition both with and without the *d*, to expreſs the relation of one thing to another.

AD Beſtias, in antiquity, is the puniſhment of criminals condemned to be thrown to wild beaſts.

AD Hominem, in logic, a kind of argument drawn from the principles or prejudices of thoſe with whom we argue.

AD Ludos, in antiquity, a ſentence upon criminals among the Romans, whereby they were condemned to entertain the people by fighting either with wild beaſts, or with one another, and thus executing juſtice upon themſelves.

AD Metalla, in antiquity, the puniſhment of ſuch criminals as were condemned to the mines, among the Romans; and therefore called *Metallici*.

AD Valorem, a term chiefly uſed in ſpeaking of the duties or cuſtoms paid for certain goods: The duties on ſome articles are paid by the number, weight, meaſure, tale, &c.; and others are paid *ad valorem*, that is, according to their value.

ADAGE, a proverb, or ſhort ſentence, containing ſome wiſe obſervation or popular ſaying. Eraſmus has made a very large and valuable collection of the Greek and Roman adages; and Mr Ray has done the ſame with regard to the Engliſh. We have alſo Kelly's collection of Scots Proverbs.

ADAGIO, in muſic. Adverbially, it ſignifies *ſoftly*, *leiſurely*; and is uſed to denote the ſloweſt of all times. Uſed ſubſtantively, it ſignifies a ſlow movement. Sometimes this word is repeated, as *adagio, adagio*, to denote a ſtill greater retardation in the time of the muſic.

ADALIDES, in the Spaniſh policy, are officers of juſtice, for matters touching the military forces. In the laws of king Alphonſus, the adalides are ſpoken of as officers appointed to guide and direct the marching of the forces in time of war. Lopez repreſents them as a ſort of judges, who take cogniſance of the difference ariſing upon excurſions, the diſtribution of plunder, &c.

ADAM, the firſt of the human race, was formed by the Almighty on the ſixth day of the creation. His body was made of the duſt of the earth; after which, God animated or gave it life, and Adam then became a rational creature.—His heavenly Parent did not leave his offspring in a deſtitute ſtate to ſhift for himſelf: but planted a garden, in which he cauſed to grow not only every tree that was proper for producing food, but likewiſe ſuch as were agreeable to the eye, or merely ornamental. In this garden were aſſembled all the brute creation; and, by their Maker, cauſed to paſs before Adam, who gave all of them names, which were judged proper by the Deity himſelf.—In this review, Adam found none for a companion to himſelf. This ſolitary ſtate was ſeen by the Deity to be attended with ſome degree of unhappineſs; and therefore he threw Adam into a deep ſleep, in which condition he took a rib from his ſide, and healing up the wound formed a woman of the rib he had taken out. On Adam's awaking, the woman was brought to him; and he immediately knew her to be one of his own ſpecies, called her his bone and his fleſh, giving her the name of *woman* becauſe ſhe was taken out of man.

The firſt pair being thus created, God gave them authority over the inferior creation, commanding them to ſubdue the earth, alſo to increaſe and multiply and fill it. They were informed of the proper food for the beaſts and for them; the graſs, or green herbs, being appointed for beaſts; and fruits or ſeeds, for man. Their proper employment alſo was aſſigned them; namely, *to dreſs the garden, and to keep it*.

Though Adam was thus highly favoured and inſtructed

ted by his Maker, there was a ſingle tree, which grew in the middle of the garden, of the fruit of which they were not allowed to eat; being told, that they ſhould ſurely die in the day they eat of it. This tree was named, *the Tree of the Knowledge of Good and Evil.* This prohibition, however, they ſoon broke through. The woman having entered into converſation with *the Serpent*, was by him perſuaded, that by eating of the tree ſhe ſhould become as wiſe as God himſelf; and accordingly, being invited by the beauty of the fruit, and its deſirable property of imparting wiſdom, ſhe plucked and eat; giving her huſband of it at the ſame time, who did likewiſe eat.

Before this tranſgreſſion of the divine command, Adam and his wife had no occaſion for clothes, neither had they any ſenſe of ſhame; but immediately on eating the forbidden fruit, they were aſhamed of being naked, and made aprons of fig-leaves for themſelves. On hearing the voice of God in the garden, they were terrified, and hid themſelves: but being queſtioned by the Deity, they confeſſed what they had done, and received ſentence accordingly; the man being condemned to labour; the woman to ſubjection to her huſband, and to pain in childbearing. They were now driven out of the garden, and their acceſs to it prevented by a terrible apparition. They had clothes given them by the Deity made of the ſkins of beaſts. In this ſtate Adam had ſeveral children; the names of only three of whom we are acquainted with, *viz.* Cain, Abel, and Seth. He died at the age of 930 years. Theſe are all the particulars concerning Adam's life, that we have on divine authority: but a vaſt multitude of others are added by the Jews, Mahometans, and others; all of which muſt be at beſt conjectural; moſt of them, indeed, appear downright falſehoods or abſurdities. The curioſity of our readers, it is preſumed, will be ſufficiently gratified by the few that are here ſubjoined.

According to the Talmudiſts, when Adam was created, his body was of immenſe magnitude. When he ſinned, his ſtature was reduced to an hundred ells, according to ſome; to nine hundred cubits, according to others; who think this was done at the requeſt of the angels, who were afraid of ſo gigantic a creature. In the iſland of Ceylon is a mountain called the *Peak* or mountain of Adam, from its being according to the tradition of the country, the reſidence of our firſt parent. Here the print of his footſteps, above two palms in length, are ſtill pointed out.

Many reveries have been formed concerning the perſonal beauty of Adam. That he was a handſome well-ſhaped man is probable; but ſome writers, not content with this, affirm, that God, intending to create man, clothed Himſelf with a perfectly beautiful human body, making this his model in the formation of the body of Adam.

Nor has the imagination been leſs indulged concerning the formation of the human ſpecies male and female.—It would be endleſs to recount all the whimſies that have been wrote on this ſubject; but as Mad. Bourignon has made a conſiderable figure in the *religious*, or rather *ſuperſtitious* world, we cannot help inſerting ſome of her opinions concerning the firſt man, which are peculiarly marvellous. According to the *revelations* of this lady, Adam before his fall poſſeſſed in himſelf the principles of both ſexes, and the virtue or power of producing his like, without the concurrent aſſiſtance of woman. The diviſion into two ſexes, ſhe imagined*, was a conſequence of man's ſin; and now, ſhe obſerves, mankind are become ſo many *monſters in nature*, being much leſs perfect in this reſpect than plants or trees, who are capable of producing their like alone, and without pain or miſery. She even imagined, that, being in an ecſtacy, we ſaw the figure of Adam before he fell, with the manner how, by himſelf, he was capable of procreating other men. "God," ſays ſhe, "repreſented to my mind the beauty of the firſt world, and the manner how he had drawn it from the chaos: every thing was bright, tranſparent, and darted forth light and ineffable glory. The body of Adam was purer and more tranſparent than cryſtal, and vaſtly fleet; through this body were ſeen veſſels and rivulets of light, which penetrated from the inward to the outward parts, through all his pores. In ſome veſſels ran fluids of all kinds and colours, vaſtly bright, and quite diaphanous. The moſt raviſhing harmony aroſe from every motion; and nothing reſiſted, or could annoy, him. His ſtature was taller than the preſent race of men: his hair was ſhort, curled, and of a colour inclining to black; his upper lip covered with ſhort hair: and inſtead of the beſtial parts which modeſty will not allow us to name, he was faſhioned as our bodies will be in the life eternal, which I know not whether I dare reveal. In that *region* his noſe was formed after the manner of a *face*, which diffuſed the moſt delicious fragrancy and perfumes; whence alſo men were to iſſue, all whoſe principles were inherent in him; there being in his belly a veſſel, where little eggs were formed; and a ſecond veſſel filled with a fluid, which impregnated thoſe eggs: and when man heated himſelf in the love of God, the deſire he had that other creatures ſhould exiſt beſides himſelf, to praiſe and love God, cauſed the fluid abovementioned (by means of the fire of the love of God) to drop on one or more of theſe eggs, with inexpreſſible delight; which being thus impregnated, iſſued, ſome time after, out of man, by this canal†, in the ſhape of an egg, whence a perfect man was hatched by inſenſible degrees. Woman was formed by taking out of Adam's ſide the veſſels that contained the eggs; which ſhe ſtill poſſeſſes, as is diſcovered by anatomiſts."

Many others have believed, that Adam at his firſt creation was both male and female: others, that he had two bodies joining together at the ſhoulders, and their faces looking oppoſite ways like thoſe of Janus. Hence, ſay theſe, when God created Eve, he had no more to do than to ſeparate the two bodies from one another‡. Of all others, however, the opinion of Paracelſus ſeems the moſt ridiculous‖. *Negabat primos parentes ante lapſum habuiſſe partes generationi hominis neceſſarias; credebat poſtea acceſſiſſe, ut ſtrumam gutturi.*

Extravagant things are aſſerted concerning Adam's knowledge. It is very probable that he was inſtructed by the Deity how to accompliſh the work appointed him, *viz.* to dreſs the garden, and keep it from being deſtroyed by the brute creatures; and it is alſo probable that he had likewiſe every piece of knowledge communicated to him that was either neceſſary or pleaſing: but that he was acquainted with geometry, mathematics, rhetoric, poetry, painting, ſculpture, *&c.* is too ridiculous to be credited by any ſober perſon. Some

* Preface to a book intitled, *Le nouveau ciel et la nouvelle terre*, Amſt. 679.

† *i. e.* the *naſal* canal, ſituated as above deſcribed.

‡ See *Androgynes*.

‖ Paracelſus *apud* Voſſium *de philoſophia*, c. ix. p. 71.

rabbies, indeed, have contented themselves with equalling Adam's knowledge to that of Moses and Solomon; while others, again, have maintained that he excelled the angels themselves. Several Christians seem to be little behind these Jews in the degree of knowledge they ascribe to Adam; nothing being hid from him, according to them, except contingent events relating to futurity. One writer indeed (Pinedo) excepts politics; but a Carthusian friar, having exhausted, in favour of Aristotle, every image and comparison he could think of, at last asserts that Aristotle's knowledge was as extensive as that of *Adam*.—In consequence of this surprising knowledge with which Adam was endued, he is supposed to have been a considerable author. The Jews pretend that he wrote a book on the creation, and another on the Deity. Some rabbies ascribe the 92^d^ psalm to Adam; and in some manuscripts the Chaldee title of this psalm expressly declares that this is the song of praise which the first man repeated for the sabbath-day.

Various conjectures have been formed concerning the place where man was first created, and where the garden of Eden was situated: but none of these have any solid foundation. The Jews tell us, that Eden was separated from the rest of the world by the ocean; and that Adam, being banished therefrom, walked across the sea, which he found every way fordable, by reason of his enormous stature*. The Arabians imagined paradise to have been in the air; and that our first parents were thrown down from it on their transgression, as Vulcan is said to have been thrown down headlong from heaven by Jupiter.

* This is just the picture of the Orion or Polyphemus of the poets. Æneid. iii. 663. 664. x. 763.

Strange stories are told concerning Adam's children. That he had none in the state of innocence, is certain from scripture; but that his marriage with Eve was not consummated till after the fall, cannot be proved from thence. Some imagine, that for many years after the fall, Adam denied himself the connubial joys by way of penance; others, that he cohabited with another woman, whose name was LILITH. The Mahometans tell us, that our first parents having been thrown headlong from the celestial paradise, Adam fell upon the isle of Serendib, or Ceylon, in the East-Indies; and Eve on Iodda, a port of the Red Sea, not far from Mecca. After a separation of upwards of 200 years, they met in Ceylon, where they multiplied: according to some Eve had twenty, according to others only eight, deliveries; bringing forth at each time twins, a male and female, who afterwards married. The Rabbins imagine that Eve brought forth Cain and Abel at a birth; that Adam wept for Abel an hundred years in the valley of tears near Hebron, during which time he did not cohabit with his wife; and that this separation would probably have continued longer, had it not been forbid by the angel Gabriel. The inhabitants of Ceylon affirm, that the salt lake on the mountain of Colembo consists wholly of the tears which Eve for one hundred years together shed because of Abel's death.

Some of the Arabians tell us, that Adam was buried near Mecca on Mount Abukobeis: others, that Noah, having laid his body in the ark, caused it to be carried after the deluge to Jerusalem by Melchisedek the son of Shem: of this opinion are the eastern Christians; but the Persians affirm that he was interred in the isle of Serendib, where his corps was guarded by lions at the time the giants warred upon one another.—St Jerom imagined that Adam was buried at Hebron; others, on Mount Calvary. Some are of opinion that he died on the very spot where Jerusalem was afterwards built; and was buried on the place where Christ suffered, that so his bones might be sprinkled with the Saviour's blood!!!

ADAM (Melchior) lived in the 17^th^ century. He was born in the territory of Grotkaw in Silesia, and educated in the college of Brieg, where the dukes of that name, to the utmost of their power, encouraged learning and the reformed religion as professed by Calvin. Here he became a firm Protestant; and was enabled to pursue his studies by the liberality of a person of quality, who had left several exhibitions for young students. He was appointed rector of a college at Heidelberg, where he published his first volume of illustrious men in the year 1615. This volume, which consisted of philosophers, poets, writers on polite literature, and historians, &c. was followed by three others; that which treated of divines was printed in 1619; that of the lawyers came next; and, finally, that of the physicians: the two last were published in 1620. All the learned men, whose lives are contained in these four volumes, lived in the 16^th^, or beginning of the 17^th^ century, and are either Germans or Flemings; but he published in 1618 the lives of twenty divines of other countries in a separate volume. All his divines are Protestants. The Lutherans were not pleased with him, for they thought him partial; nor will they allow his work to be a proper standard whereby to judge of the learning of Germany. He wrote other works besides his lives, and died in 1622.

ADAM's Apple, a name given to a species of CITRUS.

ADAM's Needle. See YUCCA.

ADAM's Peak, a high mountain of the East Indies, in the island of Ceylon, on the top of which they believe that the first man was created. See ADAM.

ADAM, or ADOM, a town in the Peræa, or on the other side the Jordan, over-against Jericho, where the Jordan began to be dried up on the passage of the Israelites; (Joshua.)

ADAMA, or ADMAH, one of the towns that were involved in the destruction of Sodom; (Moses.)

ADAMANT, a name sometimes given to the diamond. (See DIAMOND.) It is likewise applied to the scoriæ of gold, the magnet, &c.

ADAMIC EARTH, a name given to common red clay, alluding to that species of earth of which the first man is supposed to have been made.

ADAMI POMUM, in anatomy, a protuberance in the fore-part of the throat, formed by the os hyoides. It is thought to be so called upon a strange conceit, that a piece of the forbidden apple which Adam eat, stuck by the way, and occasioned it.

ADAMITES, in ecclesiastical history, the name of a sect of ancient heretics, supposed to have been a branch of the Basilidians and Carpocratians.

Epiphanius tells us, that they were called Adamites from their pretending to be re-established in the state of innocence, and to be such as Adam was at the moment of his creation, whence they ought to imitate him in his nakedness. They detested marriage; maintaining that the conjugal union would never have taken place upon earth had sin been unknown.

This

This obscure and ridiculous sect did not at first last long; but it was revived, with additional absurdities, in the twelfth century, by one Tandamus, since known by the name of *Tanchelin*, who propagated his errors at Antwerp, in the reign of the emperor Henry V. He maintained, that there ought to be no distinction between priests and laymen, and that fornication and adultery were meritorious actions. Tanchelin had a great number of followers, and was constantly attended by 3000 of these profligates in arms. His sect did not, however, continue long after his death: but another appeared under the name of *Turlupins*, in Savoy and Dauphiny, where they committed the most brutal actions in open day.

About the beginning of the fifteenth century, one Picard, a native of Flanders, spread these errors in Germany and Bohemia, particularly in the army of the famous Zisca, notwithstanding the severe discipline he maintained. Picard pretended that he was sent into the world as a new Adam, to re-establish the law of nature; and which, according to him, consisted in exposing every part of the body, and having all the women in common. This sect found also some partizans in Poland, Holland, and England: they assembled in the night; and it is asserted, that one of the fundamental maxims of their society was contained in the following verse:

Jura, perjura, secretum prodere noli.

ADAMUS, the philosopher's stone is so called by alchemists; they say it is an animal, and that it has carried its invisible *Eve* in its body, since the moment they were united by the Creator.

ADAMSHIDE, a district of the circle of Rastenburg, belonging to the king of Prussia, which, with Dombrosken, was bought, in 1737, for 42,000 dollars.

ADAMSON (Patrick), a Scottish prelate, archbishop of St Andrews. He was born in the year 1543 in the town of Perth, where he received the rudiments of his education; and afterwards studied philosophy, and took his degree of master of arts at the university of St Andrews. In the year 1566, he set out for Paris, as tutor to a young gentleman. In the month of June of the same year, Mary queen of Scots being delivered of a son, afterwards James VI. of Scotland and First of England, Mr Adamson wrote a Latin poem on the occasion. This proof of his loyalty involved him in some difficulties, having been confined in France for six months; nor would he have easily got off, had not Queen Mary, and some of the principal nobility, interested themselves in his behalf. As soon as he recovered his liberty, he retired with his pupil to Bourges. He was in this city during the massacre at Paris; and the same persecuting spirit prevailing among the catholics at Bourges as at the metropolis, he lived concealed for seven months in a public house, the master of which, upwards of 70 years of age, was thrown from the top thereof, and had his brains dashed out, for his charity to heretics. Whilst Mr Adamson lay thus in his sepulchre, as he called it, he wrote his Latin poetical version of the Book of Job, and his Tragedy of Herod in the same language. In the year 1573, he returned to Scotland; and, having entered into holy orders, became minister of Paisley. In the year 1575, he was appointed one of the commissioners, by the general assembly, to settle the jurisdiction and policy of the church; and the following year he was named, with Mr. David Lindsay, to report their proceedings to the earl of Mortoun, then regent. About this time the earl made him one of his chaplains; and on the death of bishop Douglas, promoted him to the archiepiscopal see of St Andrew's, a dignity which brought upon him great trouble and uneasiness: for now the clamour of the presbyterian party rose very high against him, and many inconsistent absurd stories were propagated concerning him. Soon after his promotion, he published his catechism in Latin verse, a work highly approved even by his enemies; but nevertheless, they still continued to persecute him with great violence. In 1578, he submitted himself to the general assembly, which procured him peace but for a very little time; for, the year following, they brought fresh accusations against him. In the year 1582, being attacked with a grievous disease, in which the physicians could give him no relief, he happened to take a simple medicine from an old woman, which did him service. The woman whose name was Alison Pearson, was thereupon charged with witchcraft, and committed to prison, but escaped out of her confinement; however, about four years afterwards, she was again found and burnt for a witch. In 1583, king James came to St Andrews; and the Archbishop, being much recovered, preached before him, and disputed with Mr Andrew Melvil, in presence of his Majesty, with great reputation, which drew upon him fresh calumny and persecution. The king, however, was so well pleased with him, that he sent him ambassador to Queen Elisabeth, at whose court he resided for some years. His conduct, during his embassy, has been variously reported by different authors. Two things he principally laboured, *viz.* the recommending the king his master to the nobility and gentry of England, and the procuring some support for the episcopal party in Scotland. By his eloquent preaching, he drew after him such crouds of people, and raised in their minds such a high idea of the young king his master, that queen Elisabeth forbad him to enter the pulpit during his stay in her dominions. In 1584, he was recalled, and sat in the parliament held in August at Edinburgh. The Presbyterian party was still very violent against the archbishop. A provincial synod was held at St Andrew's in April 1586; the Archbishop was here accused and excommunicated: he appealed to the king and the states, but this availed him little: for the mob being excited against him, he durst scarce appear in public. At the next general assembly, a paper being produced containing the archbishop's submission, he was absolved from the excommunication. In 1588, fresh accusations were brought against him. The year following, he published the Lamentations of the prophet Jeremiah in Latin verse; which he dedicated to the king, complaining of his hard usage. In the latter end of the same year, he published a translation of the Apocalypse, in Latin verse; and a copy of Latin verses, addressed also to his Majesty, when he was in great distress. The king, however, was so far from giving him assistance, that he granted the revenue of his see to the duke of Lennox; so that the remaining part of this prelate's life was very wretched, he having hardly subsistence for his family. He died in 1591.

ADANA, a town of Asia, in Natolia, and in the province of Carmania. It is seated on the river Choquen; on the banks of which stands a strong little castle built on a rock. It has great number of beautiful fountains brought from the river by means of waterworks. Over the river there is a stately bridge of fifteen arches, which leads to the water-works. The climate is very pleasant and healthy, and the winter mild and serene: but the summer is so hot as to oblige the principal inhabitants to retire into the neighbouring mountains, where they spend six months among shady trees and grottoes, in a most delicious manner. The adjacent country is rich and fertile, and produces melons, cucumbers, pomegranates, pulse, and herbs of all sorts, all the year round; besides corn, wine, and fruits in their proper season. It is 30 miles east of Tarsus, on the road to Aleppo. E. long 35. 42. N. lat. 38. 10.

ADANSONIA, ETHIOPIAN SOUR-GOURD, MONKIES-BREAD, or AFRICAN CALABASH-TREE, a genus of the monodelphia order, belonging to the polyandria class of plants; the characters of which are: The *calyx* is a perianthium one leav'd, half five-cleft, cup-form, (the divisions revolute), deciduous: The *corolla* consists of five petals, roundish nerved, revolute, growing reciprocally with the claws and stamina: the *stamina* have numerous filaments, coalesced beneath into a tube, and crowning it, expanding horizontally the antheræ kidney-form, incumbent: The *pistillum* has an egged germ; the stylus very long, tubular, variously intorted; the stigmata numerous (10) prismatic, villous, ray-expanded: The *pericarpium* is an oval capsule, woody, not gaping, ten-celled, with farinaceous pulp, the partitions membranous: The *seeds* are numerous, kidney-shaped, rather bony, and involved in a friable pulp.

There is at present but one known species belonging to this genus, the BAOBAB, which is perhaps the largest production of the whole vegetable kingdom. It is a native of Africa.

The trunk is not above 12 or 15 feet high, but from 65 to 78 feet round. The lowest branches extend almost horizontally; and as they are about 60 feet in length, their own weight bends their extremities to the ground, and thus form an hemispherical mass of verdure of about 120 or 130 feet diameter. The roots extend as far as the branches: that in the middle forms a pivot, which penetrates a great way into the earth; the rest spread near the surface. The flowers are in proportion to the size of the tree: and are followed by an oblong fruit, pointed at both ends, about 10 inches long, five or six broad, and covered with a kind of greenish down, under which is a ligneous rind, hard and almost black, marked with rays which divide it lengthwise into sides. The fruit hangs to the tree by a pedicle two feet long and an inch diameter. It contains a whitish spongy juicy substance; with seeds of a brown colour, and shaped like a kidney bean. The bark of this tree is nearly an inch thick, of an ash-coloured grey, greasy to the touch, bright and very smooth: the outside is covered with a kind of varnish; and the inside is green, speckled with red. The wood is white, and very soft; the first shoots of the ear are green and downy.

The leaves of the young plants are entire, of an oblong form, about four or five inches long, and almost three broad towards the top, having several veins running from the middle rib; they are of a lucid green colour. As the plants advance in height, the leaves alter, and are divided into three parts, and afterwards into five lobes, which spread out in the shape of an hand. The tree sheds its leaves in November, and new ones begin to appear in June. Its flowers in July, and the fruits ripens in October and November. It is very common in Senegal and the Cape de Verd islands: and is found 100 leagues up the country at Gulam, and upon the sea-coast as far as Sierra-leona.

The age of this tree is perhaps no less remarkable than its enormous size. Mr Adanson relates, that in a botanical excursion to the Magdalene islands, in the neighbourhood of Goree, he discovered some calabash-trees from five to six feet diameter, on the bark of which were engraved or cut to a considerable depth a number of European names. Two of these names, which he was at the trouble to repair, were dated one the 14th, the other the 15th century. The letters were about six inches long, but in breadth they occupied a very small part only of the circumference of the trunk: from whence he concluded they had not been cut when these trees were young. These inscriptions, however, he thinks sufficient to determine pretty nearly the age which these calabash-trees may attain; for even supposing that those in question were cut in their early years, and that trees grew to the diameter of six feet in two centuries, as the engraved letters evince, how many centuries must be requisite to give them a diameter of 25 feet which perhaps is not the last term of their growth! The inscribed trees mentioned by this ingenious Frenchman had been seen in 1555, almost two centuries before, by Thevet, who mentions them in the relation of his voyage to Terra Antarctica or Australis. Adanson saw them in 1749.

The virtues and uses of this tree and its fruit are various. The negroes of Senegal dry the bark and leaves in the shaded air; and then reduce them to powder, which is of a pretty good green colour. This powder they preserve in bags of linen or cotton, and call it *lillo*. They use it every day, putting two or three pinches of it into a mess, whatever it happens to be, as we do pepper and salt: but their view is, not to give a relish to their food, but to preserve a perpetual and plentiful perspiration, and to attemper the too great heat of the blood; purposes which it certainly answers, as several Europeans have proved by repeated experiments, preserving themselves from the epidemic fever, which, in that country, destroys Europeans like the plague, and generally rages during the months of September and October, when, the rains having suddenly ceased, the sun exhales the water left by them upon the ground, and fills the air with a noxious vapour. M. Adanson, in that critical season, made a light ptisan of the leaves of the baobab, which he had gathered in the August of the preceding year, and had dried in the shade; and drank constantly about a pint of it every morning, either before or after breakfast, and the same quantity of it every evening after the heat of the sun began to abate; he also sometimes took the same quantity in the middle of the day, but this was only when he felt some symptoms of an approaching fever. By this precaution he preserved himself, during the five years he resided at Senegal, from the diarrhœa and fever, which are so fatal there

and,

and which are, however, the only dangerous diſeaſes of the place; and other officers ſuffered very ſeverely, only one excepted, upon whom M. Adanſon prevailed to uſe this remedy, which for its ſimplicity was deſpiſed by the reſt. This ptiſan alone alſo prevents that heat of urine which is common in theſe parts, from the month of July to November, provided the perſon abſtains from wine.

The fruit is not leſs uſeful than the leaves and the bark. The pulp that envelopes the ſeeds has an agreeable acid taſte, and is eaten for pleaſure: it is alſo dried and powdered, and thus uſed medicinally in peſtilential fevers, the dyſentery, and bloody flux; the doſe is a drachm, paſſed through a fine ſieve, taken either in common water, or in an infuſion of the plantain. This powder is brought into Europe under the name of *terra ſigillata lemnia*. The woody bark of the fruit, and the fruit itſelf when ſpoiled, helps to ſupply the negroes with an excellent ſoap, which they make by drawing a ley from the aſhes, and boiling it with palm-oil that begins to be rancid.

The trunks of ſuch of theſe trees as are decayed, the negroes hollow out into burying places for their poets, muſicians, buffoons: perſons of theſe characters they eſteem greatly while they live, ſuppoſing them to derive their ſuperior talents from ſorcery or a commerce with demons; but they regard their bodies with a kind of horror when dead, and will not give them burial in the uſual manner, neither ſuffering them to be put into the ground, nor thrown into the ſea or any river, becauſe they imagine that the water would not then nouriſh the fiſh, nor the earth produce its fruits. The bodies ſhut up in theſe trunks become perfectly dry without rotting, and forming a kind of mummies without the help of embalment.

The baobab is very diſtinct from the calabaſh-tree of America, with which it has been confounded by father Labat. See CRESCENTIA.

Culture. This tree is propagated from ſeeds, which are brought from the countries where they grow naturally. Being natives only of hot climates, the plants will not thrive in the open air in Britrin, even in ſummer. The ſeeds are therefore to be ſown in pots, and plunged into a hot-bed, where the plants will appear in about ſix weeks, and in a ſhort time after be fit to tranſplant. They muſt then be planted each in a ſeparate pot, in light ſandy earth, and plunged into a hot-bed, ſhading them until they have taken root: after which they ſhould have freſh air admitted every day in warm weather; but muſt be ſparingly watered, as being apt to rot. They grow quickly for two or three years, but afterwards make little progreſs; the lower part of the ſtem then begins to ſwell, and put out lateral branches, inclining to a horizontal poſition, and covered with a light grey bark.——Some of this kind of plants were raiſed from ſeeds obtained from Grand Cairo by Dr William Sherard, in 1724, and were grown to the height of 18 feet; but were all deſtroyed by the ſevere froſt in 1740; after which they were unknown in Britain till the return of Mr Adanſon to Paris in 1754.

ADAPTERS, or ADOPTERS. See CHEMISTRY, (*Index*).

ADAR, the name of a Hebrew month, anſwering to the end of February and beginning of March, the 12th of their ſacred, and 6th of their civil year. On the 7th day of it, the Jews keep a feaſt for the death of Moſes; on the 13th, they have the feaſt of Eſther; and on the 14th, they celebrate the feaſt of Purim, for the deliverance from Haman's conſpiracy.—As the lunar year, which the Jews followed in their calculations, is ſhorter than the ſolar by about 11 days, which at the end of three years make a month, they then intercalate a 13th month, which they call *Veadar*, or the *ſecond Adar*.

ADARCE, a kind of concreted ſalts found on reeds and other vegetables, and applied by the ancients as a remedy in ſeveral cutaneous diſeaſes.

ADARCON, in Jewiſh antiquity, a gold coin mentioned in ſcripture, worth about 15s. ſterling.

ADARME, in commerce, a ſmall weight in Spain, which is alſo uſed at Buenos-Aires, and in all Spaniſh America. It is the 16th part of an ounce, which at Paris is called the *demi-gros*. But the Spaniſh ounce is ſeven *per cent*. lighter than that of Paris. Stephens renders it in Engliſh by a *dram*.

ADATAIS, ADATIS, or ADATYS, in commerce, a muſlin or cotton-cloth, very fine and clear, of which the piece is ten French ells long, and three quarters broad. It comes from the Eaſt-Indies; and the fineſt is made at Bengal.

ADCORDABILIS DENARII, in old law books, ſignify money paid by the vaſſal to his lord, upon the ſelling or exchanging of a feud.

ADCRESCENTES, among the Romans, denoted a kind of ſoldiery, entered in the army, but not yet put on duty; from theſe the ſtanding forces were recruited. See ACCENSI.

ADDA, in geography, a river of Switzerland and Italy, which riſes in mount Braulio, in the country of the Griſons, and, paſſing through the Valteline, traverſes the lake Como and the Milaneſe, and falls into the Po, near Cremona.

ADDEPHAGIA, in medicine, a term uſed by ſome phyſicians, for gluttony, or a voracious appetite.

ADDER, in zoology, a name for the VIPER. See COLUBER.

ADDER-Bolts, or *Adder-flies*. See LIBELULLA.

Sea-ADDER, the Engliſh name of a ſpecies of SYNGNATHUS.

Water-ADDER, a name given to the COLUBER *Natrix*.

ADDER-ſtung, is uſed in reſpect of cattle, when ſtung with any kind of venomous reptiles, as adders, ſcorpions, &c. or bit by a hedge-hog or ſhrew.— For the cure of ſuch bites, ſome uſe an ointment made of dragon's blood, with a little barley-meal, and the whites of eggs.

ADDER-Wort, or *Snakewood*. See POLYGONUM.

ADDEXTRATORES, in the court of Rome, the pope's mitre-bearers, ſo called, according to Ducange, becauſe they walk at the Pope's right-hand when he rides to viſit the churches.

ADDICE, or ADZE, a kind of crooked ax uſed by ſhip-wrights, carpenters coopers, &c.

ADDICTI, in antiquity, a kind of ſlaves, among the Romans, adjudged to ſerve ſome creditor whom they could not otherwiſe ſatiſfy, and whoſe ſlaves they became till they could pay or work out of the debt.

ADDICTION, among the Romans, was the making

Addictio, Addison. king over goods to another, either by sale, or by legal sentence; the goods so delivered were called *bona addicta*. Debtors were sometimes delivered over in the same manner; and thence called *servi addicti*.

ADDICTIO IN DIEM, among the Romans, the adjudging a thing to a person for a certain price, unless by such a day the owner, or some other, give more for it.

ADDISON (Lancelot), son of Lancelot Addison a clergyman, was born at Mouldismeaburne, in the parish of Crosby Ravensworth in Westmoreland, in the year 1632. He was educated at Queen's College, Oxford; and at the Restoration of king Charles II. accepted of the chaplainship of the garrison of Dunkirk: but that fortress being delivered up to the French in 1662, he returned to England, and was soon after made chaplain to the garrison of Tangier; where he continued seven years, and was greatly esteemed. In 1670, he returned to England, and was made chaplain in ordinary to the king; but his chaplainship of Tangier being taken from him on account of his absence, he found himself straitened in his circumstances, when he seasonably obtained the rectory of Milston in Wiltshire, worth about 120l. *per annum*. He afterwards became a prebendary of Sarum; took his degree of doctor of divinity at Oxford; and in 1683 was made dean of Litchfield, and the next year archdeacon of Coventry. His life was exemplary; his conversation pleasing, and greatly instructive; and his behaviour as a gentleman, a clergyman, and a neighbour, did honour to the place of his residence. He wrote, 1. A short Narrative of the Revolutions of the kingdoms of Fez and Morocco: 2. The present History of the Jews: 3. A Discourse on Catechising: 4. A Modest Plea for the Clergy: 5. An Introduction to the Sacrament: 6. The first State of Mahometism: and several other pieces. This worthy divine died on the 20th of April 1703 and left three sons: Joseph, the subject of the next article; Gulston, who died while governor of Fort St George; Lancelot, master of arts, and fellow of Magdalen College in Oxford: and one daughter first married to Dr Sartre prebendary of Westminster, and afterwards to Daniel Combes, Esq.

ADDISON (Joseph), son of dean Addison the subject of the last article. He was born at Milston, near Ambresbury, in Wiltshire, on the 11th of May 1672; and not being thought likely to live was baptized the same day. He received his first rudiments of his education at the place of his nativity, under the reverend Mr Naish; but was soon removed to Salisbury, under the care of Mr Taylor; and from thence to the charter-house, where he commenced his acquaintance with Sir Richard Steele. About fifteen, he was entered at Queen's College, Oxford, where he applied very closely to the study of classical learning, in which he made a surprising proficiency.

In the year 1687, Dr Lancaster, dean of Magdalen College, having, by chance, seen a Latin poem of Mr Addison's, was so pleased with it, that he immediately got him elected into that house, where he took up his degrees of bachelor and master of arts. His Latin pieces in the course of a few years, were exceedingly admired in both universities: nor were they less esteemed abroad, particularly by the celebrated Boileau, who is reported to have said, that he would not have written against Perrault, had he before seen such excellent pieces by a modern hand. He published nothing in English before the twenty-second year of his age; when there appeared a short copy of verses written by him, and addressed to Mr Dryden, which procured him great reputation from the best judges. This was soon followed by a translation of the Fourth Georgic of Virgil, (omitting the story of Aristæus), much commended by Mr Dryden. He wrote also the Essay on the Georgics, prefixed to Mr Dryden's translation. There are several other pieces written by him about this time; among the rest, one dated the 3d of April 1694, addressed to H. S. that is, Dr Sacheverel, who became afterwards so famous, and with whom Mr Addison lived once in the greatest friendship; but their intimacy was some time after broken off by their disagreement in political principles. In the year 1695, he wrote a poem to king William on one of his campaigns, addressed to Sir John Somers lord keeper of the great seal. This gentleman received it with great pleasure, took the author into the number of his friends, and bestowed on him many marks of his favour.

Mr Addison had been closely pressed, while at the university, to enter into holy orders; and had once resolved upon it: but his great modesty, his natural diffidence, and an uncommonly delicate sense of the importance of the sacred function, made him afterwards alter his resolution; and having expressed an inclination to travel, he was encouraged thereto by his patron abovementioned, who by his interest procured him from the crown a pension of L.300 *per annum* to support him in his travels. He accordingly made a tour to Italy in the year 1699; and, in 1701, he wrote a poetical epistle from Italy to the earl of Halifax, which has been universally esteemed as a most excellent performance. It was translated into Italian verse by the abbot Antonio Maria Salvini, Greek professor at Florence. In the year 1705, he published an account of his travels, dedicated to lord Somers; which, though at first but indifferently received, yet in a little time met with its deserved applause.

In the year 1702, he was about to return to England, when he received advice of his being appointed to attend prince Eugene, who then commanded for the emperor in Italy: but the death of king William happening soon after, put an end to this affair as well as his pension; and he remained for a considerable time unemployed. But an unexpected incident at once raised him, and gave him an opportunity of exerting his fine talents to advantage: for in the year 1704, the lord treasurer Godolphin happened to complain to lord Halifax, that the duke of Marlborough's victory at Blenheim had not been celebrated in verse in the manner it deserved; and intimated, that he would take it kindly, if his lordship, who was the known patron of the poets, would name a gentleman capable of doing justice to so elevated a subject. Lord Halifax replied, somewhat hastily, that he did know such a person, but would not mention him; adding, that long had he seen, with indignation, men of no merit maintained in luxury at the public expence, whilst those of real worth and modesty were suffered to languish in obscurity. The treasurer answered very coolly, that he was sorry there should be occasion for such an observation, but that he would do his endeavour to wipe off such reproaches for the

Addiſon. the future; and he engaged his honour, that whoever his lordſhip named, as a perſon capable of celebrating this victory, ſhould meet with a ſuitable recompence. Lord Halifax thereupon named Mr Addiſon; inſiſting, however, that the treaſurer himſelf ſhould ſend to him; which he promiſed. Accordingly he prevailed on Mr Boyle (afterwards lord Carlton) then chancellor of the exchequer, to make the propoſal to Mr Addiſon; which he did in ſo polite a manner, that our author readily undertook the taſk. The lord-treaſurer had a ſight of the piece, when it was carried no farther than the celebrated ſimilie of the angel; and was ſo pleaſed with it, that he immediately appointed Mr Addiſon a commiſſioner of appeals, vacant by the promotion of Mr Locke, choſen one of the lords commiſſioners for trade. The Campaign is addreſſed to the Duke of Marlborough; it gives a ſhort view of the military tranſactions in 1704, and contains a noble deſcription of the two great actions at Schellemberg and Blenheim. In in 1705, he attended lord Halfax to Hanover; and the year following was appointed under-ſecretary to Sir Charles Hedges ſecretary of ſtate; in which office he acquitted himſelf ſo well, that the earl of Sunderland, who ſucceeded Sir Charles in December, continued Mr Addiſon in his employment.

A taſte for operas beginning at this time to prevail in England, and many perſons having ſolicited Mr Addiſon to write one, he complied with their requeſt, and compoſed his Roſamond. This, however, whether from the defect of the muſic, or from the prejudices in favour of the Italian taſte, did not ſucceed upon the ſtage; but the poetry of it has, and always will be, juſtly admired. About this time, Sir Richard Steele compoſed his comedy of the Tender Huſband, to which Mr Addiſon wrote a prologue. Sir Richard ſurpriſed him with a dedication of this play, and acquainted the public, that he was indebted to him for ſome of the moſt excellent ſtrokes in the performance. The marquis of Wharton, being appointed lord lieutenant of Ireland in 1709, took Mr Addiſon with him as his ſecretary. Her majeſty alſo made him keeper of the records of Ireland, and, as a father mark of her favour, conſiderably augmented the ſalary annexed to that place. Whilſt he was in this kingdom, the Tatler was firſt publiſhed; and he diſcovered his friend Sir Richard Steele to be the author, by an obſervation on Virgil, which he had communicated to him. He afterwards aſſiſted conſiderably in carrying on this paper, which the author acknowledges. The Tatler being laid down, the Spectator was ſet on foot, and Mr Addiſon furniſhed great part of the moſt admired papers. The Spectator made its firſt appearance in March 1711, and was brought to a concluſion in September 1712.

His celebrated Cato appeared in 1713. He formed the deſign of a tragedy upon his ſubject when he was very young, and wrote it when on his travels: he retouched it in England, without any intention of bringing it on the ſtage; but his friends being perſuaded it would ſerve the cauſe of liberty, he was prevailed on by their ſolicitations, and it was accordingly exhibited on the theatre, with a prologue by Mr Pope, and an epilogue by Dr Garth. It was received with the moſt uncommon applauſe, having run thirty-five nights without interruption. The Whigs applauded every line in which liberty was mentioned, as a ſatire on the Tories; and the Tories echoed every clap, to ſhow that the ſatire was unfelt. When it was printed, notice was given that the Queen would be pleaſed if it was dedicated to her; "but as he had deſigned that compliment elſewhere, he found himſelf obliged," ſays Tickell, "by his duty on the one hand, and his honour on the other, to ſend it into the world without any dedication." It was no leſs eſteemed abroad, having been tranſlated into French, Italian, and German; and it was acted at Leghorn, and ſeveral other places, with vaſt applauſe. The Jeſuits of St Omers made a Latin verſion of it, and the ſtudents acted it with great magnificence. Addiſon.

About this time, another paper called the Guardian was publiſhed by Steele, to which Addiſon was a principal contributor. It was a continuation of the Spectator, and was diſtinguiſhed by the ſame elegance and the ſame variety; but, in conſequence of Steele's propenſity to politics, was abruptly diſcontinued in order to write the Engliſhman.

The papers of Addiſon are marked in the Spectator by one of the letters in the name of *Clio*, and in the Guardian by a *Hand*. Many of theſe papers were written with powers truly comic, with nice diſcrimination of characters, and accurate obſervation of natural or accidental deviations from propriety; but it was not ſuppoſed that he had tried a comedy on the ſtage, till Steele, after his death, declared him the author of "The Drummer." This, however, he did not know to be true by any cogent teſtimony: for when Addiſon put the play into his hands, he only told him it was the work of a gentleman in the company; and when it was received, as is confeſſed, with cold diſapprobation, he was probably leſs willing to claim it. Tickell omitted it in his collection; but the teſtimony of Steele, and the total ſilence of any other claimant, has determined the public to aſſign it to Addiſon, and it is now printed with his other poetry. Steele carried "The Drummer" to the playhouſe, and afterwards to the preſs, and ſold the copy for 50 guineas. To Steele's opinion may be added the proof ſupplied by the play itſelf, of which the characters are ſuch as Addiſon would have delineated, and the tendency ſuch as Addiſon would have promoted.

It is ſaid that Mr Addiſon intended to have compoſed an Engliſh dictionary upon the plan of the Italian (Della Cruſca); but, upon, the death of the queen being appointed ſecretary to the lords juſtices, he had not leiſure to carry on ſuch a work. When the earl of Sunderland was appointed lord lieutenant of Ireland, Mr Addiſon was again made ſecretary for the affairs of that kingdom; and upon the earl's being removed from the lieutenancy, he was choſen one of the lords of trade.

Not long afterwards an attempt was made to revive the Spectator, at a time indeed by no means favourable to literature, when the ſucceſſion of a new family to the throne filled the nation with anxiety, diſcord, and confuſion; end either the turbulence of the times or the ſatiety of the readers put a ſtop to the publication, after an experiment of 80 numbers, which were afterwards collected into an eighth volume, perhaps more valuable than any of thoſe that went before it: Addiſon produced more than a fourth part.

Addison.

In 1715, he began the Freeholder, a political paper, which was much admired, and proved of great use at that juncture. He published also, about this time, verses to Sir Godfrey Kneller upon the king's picture, and some to the princess of Wales with the tragedy of Cato.

Before the arrival of king George he was made secretary to the regency, and was required by his office to send notice to Hanover that the queen was dead, and that the throne was vacant. To do this would not have been difficult to any man but Addison, who was so overwhelmed with the greatness of the event, and so distracted by choice of expression, that the lords, who could not wait for the niceties of criticism, called Mr Southwell, a clerk in the house, and ordered him to dispatch the message. Southwell readily told what was necessary, in the common style of business, and valued himself upon having done what was too hard for Addison.

In 1716, he married the countess dowager of Warwick, whom he had solicited by a very long and anxious courtship. He is said to have first known her by becoming tutor to her son. The marriage, if uncontradicted report can be credited, made no addition to his happiness; it neither found them nor made them equal. She always remembered her own rank, and thought herself intitled to treat with very little ceremony the tutor of her son. It is certain that Addison has left behind him no encouragement for ambitious love. The year after, 1717, he rose to his highest elevation, being made secretary of state; but is represented as having proved unequal to the duties of his place. In the house of commons he could not speak, and therefore was useless to the defence of the government. In the office he could not issue an order without losing his time in quest of fine expressions. At last, finding by experience his own inability for public business, he was forced to solicit his dismission, with a pension of 1500l. a-year. Such was the account of those who were inclined to detract from his abilities; but by others his relinquishment was attributed to declining health, and the necessity of recess and quiet.

In his retirement, he applied himself to a religious work *, which he had begun long before; part of which, scarce finished, has been printed in his works. He intended also to have given an English paraphrase of some of David's psalms. But his ailments increased, and cut short his designs. He had for some time been oppressed by an asthmatic disorder, which was now aggravated by a dropsy, and he prepared to die conformably to his precepts and professions. He sent, as Pope relates, a message by the earl of Warwick to Mr Gay, desiring to see him: Gay, who had not visited him for some time before, obeyed the summons, and found himself received with great kindness. The purpose for which the interview had been solicited was then discovered: Addison told him, that he had injured him; but that if he recovered, he would recompense him. What the injury was he did not explain, nor did Gay ever know; but supposed that some preferment designed for him had by Addison's intervention been withheld.—Another death-bed interview, of a more solemn nature, is recorded: Lord Warwick was a young man of very irregular life, and perhaps of loose opinions. Addison, for whom he did not want respect, had very diligently endeavoured to reclaim him; but his arguments and expostulations had no effect: One experiment, however, remained to be tried. When he found his life near its end, he directed the young lord to be called: and when he desired, with great tenderness, to hear his last injunctions, told him, "I have sent for you that "you may see how a Christian can die." What effect this awful scene had on the earl's behaviour is not known: he died himself in a short time. Having given directions to Mr Tickell for the publication of his works, and dedicated them on his death-bed to his friend Mr Craggs, he died June 17. 1719, at Holland-house, leaving no child but a daughter who is still living.

* Evidences of the Xian Religion.

Addison's course of life before his marriage has been detailed by Pope. He had in the house with him Budgell, and perhaps Philips. His chief companions were Steele, Budgell, Philips, Carey, Davenant, and Colonel Brett. With one or other of these he always breakfasted. He studied all morning; then dined at a tavern, and went afterwards to Button's. From the coffeehouse he went again to the tavern, where he often sat late, and drank too much wine.

Dr Johnson, in delineating the character of Addison, observes with Tickell, that he employed wit on the side of virtue and religion. He not only made the proper use of wit himself, but taught it to others; and from his time it has been generally subservient to the cause of reason and truth. He has dissipated the prejudice that had long connected gaiety with vice, and easiness of manners with laxity of principles. He has restored virtue to its dignity, and taught innocence not to be ashamed. This is an elevation of literary character, "above all Greek, above all Roman fame." No greater felicity can genius attain than that of having purified intellectual pleasure, separated mirth from indecency, and wit from licentiousness; of having taught a succession of writers to bring elegance and gaiety to the aid of goodness; and, to use expressions yet more awful, of having "turned many to righte-"ousness." As a describer of life and manners, he must be allowed to stand perhaps the first of the first rank. His humour, which, as Steele observes, is peculiar to himself, is so happily diffused as to give the grace of novelty to domestic scenes and daily occurrences. He never "outsteps the modesty of nature," nor raises merriment or wonder by the violation of truth. His figures neither divert by distortion, nor amaze by aggravation. He copies life with so much fidelity, that he can be hardly said to invent; yet his exhibitions have an air so much original, that it is difficult to suppose them not merely the product of imagination. As a teacher of wisdom he may be confidently followed. His religion has nothing in it enthusiastic or supercilious; he appears neither weakly credulous nor wantonly sceptical; his morality is neither dangerously lax nor impracticably rigid. All the enchantment of fancy and all the cogency of argument are employed to recommend to the reader his real interest, the care of pleasing the Author of his being. Truth is shown sometimes as the phantom of a vision, sometimes appears half-veiled in an allegory; sometimes attracts regard in the robes of fancy, and sometimes steps forth in the confidence of reason. She wears a thousand dresses, and in all is pleasing.

The

Addison. The Doctor, however, has related the following anecdote, which every admirer of Addison, every man of feeling, must be reluctant to believe. "Steele (says the Doctor), whose imprudence of generosity, or vanity of profusion, kept him always incurably necessitous, upon some pressing exigence, in an evil hour, borrowed an hundred pounds of his friend, probably without much purpose of repayment; but Addison, who seems to have had other notions of a hundred pounds, grew impatient of delay, and reclaimed his loan by an execution. Steele felt, with great sensibility, the obduracy of his creditor; but with emotions of sorrow rather than of anger." It is much to be wished, says Dr Kippis, that Dr Johnson had produced his authority for this narration. It is very possible, that it may be only a story the Doctor had somewhere heard in conversation, and which is entirely groundless: "and this I am the rather inclined to believe, as I have been assured by one of the most respectable characters in the kingdom, that the fact hath no foundation in truth." Mr Potter, in a late publication, hath informed us, that he is told by the best authority, that the story is an absolute falsehood.

Mr Tyers, in "An historical Essay on Mr Addison," printed, but not published, has mentioned some facts concerning him, with which we were not before acquainted. These are, That he was laid out for dead as soon as he was born: that, when he addressed his verses on the English poets to Henry Sacheverell, he courted that gentleman's sister: that, whenever Jacob Tonson came to him for the Spectator, Bayle's French Historical and Critical Dictionary lay always open before him: that, upon his return to England, after his travels, he discharged some old debts he had contracted at Oxford, with the generosity of good interest: that he was put into plentiful circumstances by the death of a brother in the East Indies: that, having received encouragement from a married lady, of whom he had been formerly enamoured, he had the integrity to resist the temptation: that he refused a gratification of a three hundred pounds bank-note, and afterwards of a diamond ring of the same value, from a Major Dunbar, whom he had endeavoured to serve in Ireland by his interest with lord Sunderland: and that his daughter by lady Warwick is still alive and unmarried, residing at Bilton near Rugby, and possessing an income of more than twelve hundred a-year.

The following letter, which probably relates to the case of Major Dunbar, reflects great honour on Mr Addison's integrity. "*June* 26. 1715. Sir, I find there is a very strong opposition formed against you; but I shall wait on my lord lieutenant this morning, and lay your case before him as advantageously as I can, if he is not engaged in other company. I am afraid what you say of his grace does not portend you any good. And now, Sir, believe me, when I assure you I never did, nor ever will, on any pretence whatsoever, take more than the stated and customary fees of my office. I might keep the contrary practice concealed from the world, were I capable of it, but I could not from myself; and I hope I shall always fear the reproaches of my own heart more than those of all mankind. In the mean time, if I can serve a gentleman of merit, and such a character as you bear in the world, the satisfaction I meet with on such an occasion is always a sufficient, and the only reward to, Sir, your most obedient, humble servant, J. Addison."—The anecdote which follows was told by the late Dr Birch. Addison and Mr Temple Stanyan were very intimate. In the familiar conversations which passed between them, they were accustomed freely to dispute each other's opinions. Upon some occasion, Mr Addison lent Stanyan five hundred pounds. After this, Mr Stanyan behaved with a timid reserve, deference, and respect; not conversing with the same freedom as formerly, or canvassing his friend's sentiments. This gave great uneasiness to Mr Addison. One day, they happened to fall upon a subject, on which Mr Stanyan had always been used strenuously to oppose his opinion. But, even upon this occasion, he gave way to what his friend advanced, without interposing his own view of the matter. This hurt Mr Addison so much, that he said to Mr Stanyan, "Either contradict me, or pay me the money."

In Tickell's edition of Mr Addison's works there are several pieces hitherto unmentioned, viz. The Dissertation on Medals; which, though not published till after his death, yet he had collected the materials, and began to put them in order, at Vienna, in 1702. A pamphlet, intitled, The present State of the War, and the Necessity of an Augmentation, considered. The late Trial and Conviction of Count Tariff. The Whig Examiner came out on the 14th of September 1716: there were five of these papers attributed to Mr Addison, and they are the severest pieces he ever wrote. He is said also to have been the author of a performance intitled *Dissertatio de insignioribus Romanorum Poetis*, and of a Discourse on Ancient and Modern learning.

Additament ‖ Additions of place.

ADDITAMENT, something added to another. Thus physicians call the ingredients added to a medicine already compounded, *additaments*.

ADDITION, is the joining together or uniting two or more things, or augmenting a thing by the accession of others thereto.

Addition, in Arihmetic, Algebra, &c. See these articles.

Addition, in music, a dot marked on the right side of a note, signifying that it is to be sounded or lengthened half as much more as it would have been without such mark.

Addition, in law, is that name or title which is given to a man over and above his proper name and surname, to show of what estate, degree, or mystery he is; and of what town, village, or country.

Additions of Estate, or *Quality*, are, Yeoman, Gentleman, Esquire, and such like.

Additions of Degree, are those we call names of dignity; as Knight, Lord, Earl, Marquis, and Duke.

Additions of Mystery, are such as scrivener, painter, mason, and the like.

Additions of Place, are, of Thorp, of Dale, of Woodstock.—Where a man hath household in two places, he shall be said to dwell in both; so that his addition in either may suffice. Knave was anciently a regular addition. By stat. 1. Hen. V. cap. 5. it was ordained, that in such suits or actions where process of outlawry lies, such addition should be made to the name of the defendant, to show his estate, mystery, and place where he dwells; and that the writs not having

ving such additions shall abate if the defendant take exception thereto; but not by the office of the court. The reason of this ordinance was, that one man might not be troubled by the outlawry of another; but by reason of the certain addition, every person might bear his own burden.

ADDITIONS, in distilling, a name given to such things as are added to the wash, or liquor, while in a state of fermentation in order to improve the vinosity of the spirit, procure a larger quantity of it, or give it a particular flavour. All things, of whatever kind, thus added in the time of fermentation, are called by those of the business who speak most intelligently, *additions*; but many confound them with things of a very different nature, under the name of *ferments*. See DISTILLING.

ADDITIONS, in heraldry, some things added to a coat of arms, as marks of honour; and therefore directly opposite to abatements. Among additions we reckon BORDURE, QUARTER, CANTON, GYRON, PILE, &c. See These articles.

ADDRESS, in a general sense, is used for skill and good management, and of late has been adopted from the French. It is used also in commerce, as synonymous with direction to a person or place. The word is formed of the French verb *adresser, To direct any thing to a person.*

ACDUCENT MUSCLES, or ADDUCTORS, in anatomy, those muscles which pull one part of the body towards another. See ANATOMY, *Table of the Muscles.*

ADEB, in commerce, the name of a large Egyptian weight, used principally for rice, and consisting of 210 okes, each of three rotolos, a weight of about two drams less than the English pound. But this is no certain weight; for at Rosetto the adeb is only 150 okes.

ADEL, a kingdom on the eastern coast of Africa, which reaches as far as the straits of Babelmandel, which unite the Red Sea to the sea of Arabia. This country produces corn, and feeds a great number of cattle. The inhabitants carry on a trade in gold, silver, ivory, oil, frankincense, a sort of pepper, and other merchandises of Arabia and the Indies. The king was formerly a vassal to the grand negus of Abyssinia: but being Mahometans, and the Abyssinians a sort of Christians, they could not agree; and in 1435 came to an open rupture, when the Adelines threw off the yoke, seeking protection from the Grand Signior. The principal places are, Adela, seated in the centre of the country, and is the town where the king resides: Zeila, near the Arabian Sea, is a rich town, and has a good trade: Barbora, near the sea-coast, is an ancient trading town. It rains very seldom in this country.

ADELIA, a genus of the monodelphia order, belonging to the diœcia class of plants; the characters of which are: The MALE *calyx* is a perianthium one-leaved, three-parted; the florets sublanced and concave: No *corolla*: The *stamina* consist of many capillary filaments the length of the calyx, conjoined at the base in a cylinder; the antheræ are roundish. The FEMALE *calyx* is a five-leaved perianthium; the leaflets sublanced, concave, persistent: No *corolla*: The *pistillum* has a roundish germen; the styli are three, short, and divaricated; the stigmata lacerated: The *perianthium* is a three-grained, roundish, three-celled capsule: The *seeds* are solitary and roundish. In the natural method, this genus belongs to the 38th order, Tricoccæ. Of this genus there are three species; the *bernardia*, the *ricinella*, and *acidoton*, for which we have no proper names in English. They are natives of Jamaica, and are akin to the ricinus or croton, and may be propagated in hot-beds from seeds procured from Jamaica.

ADELME, or ALDHELM, son to Kenred, nephew to Ina king of the West-Saxons; after having been educated abroad, was abbot of Malmsbury 30 years. He was the first Englishman who wrote in Latin, the first who brought poetry into England, and the first bishop of Sherburn. He lived in great esteem till his death, which happened in 709. He was canonized, and many miracles were told of him. He is mentioned with great honour by Camden and Bayle, and his life was written by William of Malmsbury.

ADELPHIANI, in church-history, a sect of ancient heretics, who fasted always on Sundays.

ADELSCALC, in ancient customs, denotes a servant of the king. The word is also written *adelscalche*, and *adelscalcus*. It is compounded of the German *adel*, or *edel*, "noble," and *scalc*, "servant." Among the Bavarians, *adelscalcs* appear to have been the same with royal *thanes* among the Saxons, and those called *ministri regis* in ancient charters.

ADEMPTION, in the civil law, implies the revocation of a grant, donation, or the like.

ADEN, formerly a rich and considerable town of Arabia the Happy. It is seated by the sea-side, a little eastward of the straits of Babelmandel.

ADENANTHERA, BASTARD FLOWER-FENCE, a genus of the monogynia order, belonging to the decandria class of plants. In the natural method, it belongs to the 33d order, *Lomentaceæ*. The characters are: The *calyx* is a perianthium consisting of one very small five-toothed leaf. The *corolla* consists of five bell-shaped lanceolate sessile petals, convex within and concave under. The *stamina* have ten erect subulated filaments shorter than the corolla; the antheræ are roundish, incumbent, bearing a globular gland on the exterior top. The *pistillum* has a long gibbous germen; the stylus subulated the length of the stamina; the stigma simple. The *pericarpium* is a long compressed membranous legumen. The *seeds* are very numerous, roundish, and remote.

Only one species of this plant is known in Britain: but there is a variety, with scarlet seeds; which, however, is rare, and grows very slowly. It is a native of India, and rises to a considerable height. It is as large as the tamarind tree; spreads its branches wide on every side, and makes a fine shade; for which reason, it is frequently planted by the inhabitants in their gardens or near their habitations. The leaves of this tree are doubly winged, the flowers of a yellow colour, and disposed in a long bunch. These are succeeded by long twisted membranaceous pods, inclosing several hard compressed seeds, of a beautiful scarlet, or shining black, colour. This plant must be raised in a hot-bed, and kept during the winter in a stove.

ADENBURG, or ALDENBURG, a town of Westphalia, and in the duchy of Burg, subject to the Elector Palatine. It is 12 miles N. E. of Cologne, and 17 W. of Bonn: E. Long. 7. 25. Lat. 51. 2.

ADENOGRAPHY, that part of anatomy which treats of the glandular parts. See ANATOMY.

ADENOIDES, glandulous, or of a glandular form; an epithet applied to the PROSTATÆ.

ADENOLOGY, the same with Adenography.

ADENOS, a kind of cotton, otherwise called *marine cotton*. It comes from Aleppo by the way of Marseilles, where it pays 20 *per cent*. duty.

ADEONA, in mythology, the name of a goddess invoked by the Romans when they set out upon a journey.

ADEPHAGIA, in mythology, the goddess of gluttony, to whom the Sicilians paid religious worship.

ADEPS, in anatomy, the fat found in the abdomen. It also signifies animal fat of any kind.

ADEPTS, a term among alchemists for those who pretended to have found the panacea or philosopher's-stone.

ADERBIJAN, a province of Persia, bounded on the N. by Armenia Proper, on the S. by Irac-Agemi, on the E. by Ghilan, and on the W. by Curdistan. The principal town is Tauris; from 42. to 48. E. long. from 36. to 39. lat.

ADERNO, a small place in the Val di Demona in the kingdom of Sicily: E. long. 15. 25. lat. 28. 5. The ancient ADRANUM.

ADES, or HADES, denotes the invisible state. In the heathen mythology, it comprehends all those regions that lie beyond the river Styx, viz. Erebus, Tartarus, and Elysium. See HELL.

ADESSENARIANS, ADESSENARII, in church-history, a sect of Christians who hold the real presence of Christ's body in the eucharist, though not by way of transubstantiation. They differ considerably as to this presence; some holding that the body of Christ is in the bread; others that it is about the bread; and others that is under the bread.

ADFILIATION, a Gothic custom, whereby the children of a former marraige are put upon the same footing with those of the second. This is also called *unio prolium*, and still retained in some parts of Germany.

AD FINES (Antonine), a town of Swisserland, supposed to be the modern *Pfin*, in the north of the district of Turgow, on the rivulet Thur, not far from the borders of Suabia, about half-way between Constance and Frauenfield. So called, because when Cecinna, general of the emperor Vitellius, with the auxiliary Rhetians, defeated the Helvetii, the former extended their borders thus far, their territory ending here; and, in time of the Romans, it was the last town in this quarter, and of some repute.

ADHA, a festival which the Mahometans celebrate on the 10th day of the month *Dhoulhegiat*, which is the 12th and last of their year. This month being particularly destined for the ceremonies which the pilgrims observe at Mecca, it takes its name from thence, for the word signifies *the month of Pilgrimage*. On that day they sacrifice with great solemnity, at Mecca, and no where else, a sheep, which is called by the same name as the festival itself. The Turks commonly call this festival the *Great Bairam*, to distinguish it from the lesser, which ends their fast, and which the Christians of the levant call the *Easter of the Turks*. The Mahometans celebrate this festival, out of the city of Mecca, in a neighbouring valley; and sometimes they sacrifice there a camel. See BAIRAM.

ADHATODA, in botany. See JUSTICIA.

ACTION OF ADHERENCE, in Scots law; an action competent to a husband or wife, to compel either party to adhere, in case of desertion.

ADHESION, in a general sense, implies the sticking or adhering of bodies together,

ADHESION, in philosophy. See COHESION.

ADHESION, in anatomy, a term for one part sticking to another, which in a natural state are separate. For the most part, if any of those parts in the thorax or belly lie in contact, and inflame, they grow together. The lungs very frequently adhere to the pleura.

ADHIL, in astronomy, a star of the sixth magnitude, upon the garment of Andromeda, under the last star in her foot.

ADHOA, in ancient customs, denotes what we otherwise call *relief*. In which sense we sometimes also find the word written *adoha*, *adhoamentum*, and *adhogamentum*.

ADIANTHUM, MAIDEN-HAIR; a genus of the order of filices, belonging to the cryptogamia class of plants. The fructifications are collected in oval spots under the reflected tops of the fronds.

Species. Of this genus botanical writers enumerate fifteen species; the most remarkable are the following. 1. The capillus veneris, or true maiden-hair, is a native of the southern parts of France, from whence it is brought to Britain; though it is likewise said to grow plentifully in Cornwall, and the Trichomanes has been almost universally substituted for it. 2. The pedatum, or American maiden-hair, is a native of Canada; and grows in such quantities, that the French send it from thence in package for other goods, and the apothecaries of Paris use it for maiden-hair in the compositions wherein that is ordered. 3. The trapeziforme, or black American maiden-hair, is a native of Jamaica; and has shining black stalks, and leaves of an odd shape, which make an agreeable variety among other plants, so is sometimes cultivated in gardens.

Culture. The first species grows naturally out of the joints of walls, and fissures of rocks. It ought therefore to be planted in pots filled with gravel and lime-rubbish; where it will thrive much better than in good earth. It must also be sheltered under a frame during the winter.—The second is to be treated in the same manner; but the third will not thrive in Britain, unless kept in a stove during the winter.

Properties. The true maiden-hair has been greatly celebrated in disorders of the breast proceeding from a thinness and acrimony of the juices; and likewise for opening obstructions of the viscera, and promoting the expectoration of tough phlegm. But modern practice pays little regard to it; the asplenium trichomanes, or English maiden-hair, supplying its place. See ASPLENIUM.

ADIAPHORISTS, in church-history, a name importing lukewarmness, given, in the 16th century, to the moderate Lutherans, who embraced the opinions of Melancthon, whose disposition was vastly more pacific than that of Luther.

ADIAPHOROUS, ADIAPHORUS, a name given by Mr Boyle to a kind of spirit distilled from tartar and some other vegetable bodies; and which is neither acid, vinous, nor urinous; but in many respects different from any other sort of spirit.

ADJAZZO, ADRAZZO, or AJACCIO, in geography, a handsome town and castle of Corsica in the Mediterranean, with a bishop's see, and a good harbour. It is populous, and fertile in wine. It is 27 miles S. W. of Corte. E. long. 41. 54. lat. 38. 5.

ADJECTIVE, in grammar, a kind of noun joined with a substantive, either expressed or implied, to show its qualities or accidents. See GRAMMAR.

ADIGE, a river in Italy, which taking its rise south of the lake Glace among the Alps, runs south by Trent, then east by Verona in the territory of Venice, and falls into the gulph of Venice, north of the mouth of the Po.

ADJOURNMENT, the putting off a court, or other meeting, till another day. In England there is a difference between the adjournment and the prorogation of the parliament; the former being not only for a shorter time, but also done by the house itself; whereas the latter is an act of royal authority.

ADIPOSE, a term used by anatomists for any cell, membrane, &c. that is remarkable for its fatness.

ADIRBEITSAN, in geography, a province of Persia, in Asia, and part of the ancient Media. It is bounded on the N. by the province of Shirvan, on the S. by Irac-Agemi and Curdistan, on the E. by Gilan and the Caspian sea, and on the W. by Turcomania.

ADIT, in a general sense, the passage to, or entrance of, any thing.

ADIT of a Mine, the hole, or aperture, whereby it is entered and dug, and by which the water and ores are carried away. The term amounts to the same with *cuniculus* or *drift*, and is distinguished from *air-shaft*. The adit is usually made on the side of a hill, towards the bottom thereof, about four, five, or six feet high, and eight wide, in form of an arch; sometimes cut in the rock, and sometimes supported with timber, so conducted as that the sole or bottom of the adit may answer to the bottom of the shaft, only somewhat lower, that the water may have a sufficient current to pass away without the use of the pump. Damps and the impurity of the air are the great impediments against driving adits above 20 or 30 fathoms, by reason of the necessity, in this case, of letting down air-shafts from the day to meet the adit, which are often very expensive, both on account of the great depth of mines, and the hardness of the mineral strata to be cut through. The best remedy against this is that practised in the coal-mines, near Liege, where they work their adits without air-shafts: the manner of which is described by Sir Robert Moray. Vid. Phil. Trans. N° 5.

ADIT of a Mine is sometimes used for the air-shaft itself, being a hole driven perpendicularly from the surface of the earth into some part of the mine, to give entrance to the air. To draw off the standing water in winter, in deep mines, they drive up an adit, or air-shaft, upon which the air disengages itself from the water, when it begins to run with such violence as produces a noise equal to the bursting of a cannon, dashes every thing in the way against the sides of the mine, and loosens the very rocks at a distance. Ibid. N° 26.

ADJUDICATION, implies the act of adjudging, or determining, a cause in favour of some person.

ADJUDICATION, in Scots law, the name of that action by which a creditor attaches the heritable estate of his debtor, or his debtor's heir, in order to appropriate it to himself, either in payment or security of his debt; or that action by which the holder of an heritable right, labouring under any defect in point of form, may supply that defect.

ADJUNCT, among philosophers, signifies something added to another, without being any necessary part of it. Thus water absorbed by cloth or a sponge, is an adjunct, but no necessary part of either of these substances.

ADJUNCT, in metaphysics, some quality belonging to either the body or mind, whether natural or acquired. Thus thinking is an adjunct of the mind, and growth an adjunct of the body.

ADJUNCT, in music, a word which is employed to denominate the connection or relation between the principal mode and the modes of its two-fifths, which, from the intervals that constitute the relation between them and it, are called its *adjuncts*.

ADJUNCT is also used to signify a colleague, or some person associated with another as an assistant.

ADJUNCT Gods, or *ADJUNCTS of the Gods*, among the Romans, were a kind of inferior deities, added as assistants to the principal ones, to ease them in their functions. Thus, to Mars was adjoined Bellona and Nemesis; to Neptune, Salacia; to Vulcan, the Cabiri; to the Good Genius, the Lares; to the Evil, the Lemures, &c.

ADJUNCTS, in rhetoric and grammar, signify certain words or things added to others, to amplify or augment the force of the discourse.

ADJUNCTS, or ADJOINTS, in the royal academy of sciences at Paris, denote a class of members, attached to the pursuit of particular sciences. The class of *Adjuncts* was created in 1716, in lieu of the *Eleves*: they are twelve in number; two for geometry, two for mechanics, two for astronomy, two for anatomy, two for chemistry, and two for botany. The *Eleves* not taken into this establishment were admitted on the foot of supernumerary *Adjuncts*.

ADJUTANT, in the military art, is an officer whose business it is to assist the major. Each battalion of foot and regiment of horse has an adjutant, who receives the orders every night from the brigade-major; which, after carrying them to the colonel, he delivers out to the serjeants. When detachments are to be made, he gives the number to be furnished by each company or troop, and assigns the hour, and place of rendezvous. He also places the guards; receives, and distributes the ammunition to the companies, &c.; and, by the major's orders, regulates the prices of bread, beer, and other provisions. The word is sometimes used by the French for an *aid-du-camp*.

ADJUTANTS-general, among the jesuits, a select number of fathers, who resided with the general of the order, each of whom had a province or country assigned him, as England, Holland, &c. and their business was to inform the father-general of state-occurrences in such countries. To this end they had their correspondents delegated, emissaries, visitors, regents, provincials, &c.

ADJUTORIUM, a term used by physicians for any medicine in a prescription but the capital one.

ADLE-EGGS, such as have not received an impregnation from the semen of the cock.

ADLEGATION, in the public law of the German empire, a right claimed by the states of the empire of adjoin-

adjoining plenipotentiaries, in public treaties and negociations, to thoſe of the emperor, for the tranſacting of matters which relate to the empire in general. In which ſenſe *adlegation* differs from *legation*, which is the right of ſending ambaſſadors on a perſon's own account.—Several princes and ſtates of the empire enjoy the right of *legation*, who have not that of *adlegation*, and *vice verſa*. The biſhops, for inſtance, have the right of *adlegation* in the treaties which concern the common intereſt, but no right of *legation* for their own private affairs. The like had the duke of Mantua.—The emperor allows the princes of Germany the privilege of *legation*, but diſputes that of *adlegation*. They challenge it as belonging to them *jure regni*, which they enjoy in common with the emperor himſelf.

ADLOCUTION, Adlocutio, in antiquity, is chiefly underſtood of ſpeeches made by Roman generals to their armies, to encourage them before a battle. We frequently find theſe adlocutions expreſſed on medals by the abbreviature Adlocut. Coh.—The general is ſometimes repreſented as ſeated on a tribunal, often on a bank or mount of turf, with the cohorts ranged orderly round him, in *manipuli* and *turmæ*. The uſual formula in adlocutions was, *Fortis eſſet ac fidus*.

ADMANUENSES, in ancient law books, denote perſons who ſwore by laying their hands on the book.—In which ſenſe, *admanuenſes* amount to the ſame with laymen; and ſtand oppoſed to clerks, who were forbid to ſwear on the book, their word being to be reputed as their oath; whence they were alſo denominated *fide digni*.

ADMEASUREMENT, Admensuratio, in law, a writ which lies for the bringing thoſe to reaſon, or mediocrity, who uſurp more of any thing than their ſhare. This writ lies in two caſes; termed,

Admeasurement of Dower, Admenſuratio dotis, where the widow of the deceaſed holds more from the heir, or his guardian, on account of her dower, than of right belongs to her. And,

Admeasurement of Paſture, Admenſuratio paſturæ; this lies between thoſe who have common of paſtures appendant to their freehold, or common by vicinage, in caſe any of them ſurcharge the common with more cattle than they ought.

ADMINICLE, a term uſed chiefly in old law-books, to imply an aid, help, aſſiſtance, or ſupport. The word is Latin, *adminiculum*; and derived from *adminiculor*, to prop or ſupport.

Adminicle, in Scots law, ſignifies any writing or deed referred to by a party, in an action of law, for proving his allegations.

ADMINICULATOR, an ancient officer of the church, whoſe buſineſs it was to attend to and defend the cauſe of the widows, orphans, and others deſtitute of help.

ADMINISTRATION, in general, the government, direction, or management of affairs, and particularly the exerciſe of diſtributive juſtice; among eccleſiaſtics, it is often uſed to expreſs the giving or diſpenſing the ſacraments, &c.

Administration, is alſo the name given by the Spaniards in Peru to the ſtaple magazine, or warehouſe, eſtabliſhed at Callao, a ſmall town on the S. Sea, which is the port of Lima, the capital of that part of South America, and particularly of Peru. The foreign ſhips, which have leave to trade along that coaſt, are obliged to unload here, paying 13 *per cent.* of the price they ſell for, if the cargo be entire, and even 16 *per cent.* if otherwiſe; beſides which, they pay 3 *per* 1000, duty, for conſulſhip and ſome other ſmall royal rights and claims.

ADMINISTRATOR, in law, he to whom the ordinary commits the adminiſtration of the goods of a perſon deceaſed, in default of an executor.—An action lies for, or againſt an adminiſtrator, as for, or againſt an executor; and he ſhall be accountable to the value of the goods of the deceaſed, and no farther:—unleſs there be waſte, or other abuſe chargeable on him. If the adminiſtrator die, his executors are not adminiſtrators; but the court is to grant a new adminiſtration.—If a ſtranger, who is neither adminiſtrator nor executor, takes the goods of the deceaſed, and adminiſter, he ſhall be charged, and ſued as an executor, not as an adminiſtrator. The origin of adminiſtrators is derived from the civil law. Their eſtabliſhment in England is owing to a ſtatute made in the 31ſt year of Edw. III. Till then, no office of this kind was known beſide that of executor; in caſe of a want of which, the ordinary had the diſpoſal of goods of perſons inteſtate, &c.

Administrator, in Scots law, a perſon legally impowered to act for another whom the law preſumes incapable of acting for himſelf. Thus tutors or curators are ſometimes ſtyled *adminiſtrators in law* to pupils, minors, or fatuous perſons. But more generally the term is uſed to imply that power which is conferred by the law upon a father over the perſons and eſtates of his children during their minority. See Law, N°clxi.

Administrator, is ſometimes uſed for the preſident of a province; for a perſon appointed to receive, manage, and diſtribute, the revenues of an hoſpital or religious houſe; for a prince who enjoys the revenues of a ſecularized biſhopric; and for the regent of a kingdom during a minority of the prince, or a vacancy of the throne.

ADMIRABILIS sal, the ſame with Glauber's ſalt. See Chemistry, n° 124.

ADMIRAL, a great officer or magiſtrate, who has the government of a navy, and the hearing of all marine cauſes.

Authors are divided with regard to the origin and denomination of this important officer, whom we find eſtabliſhed in moſt kingdoms that border on the ſea. But the moſt probable opinion is that of Sir Henry Spelman, who thinks, that both the name and dignity were derived from the Saracens, and, by reaſon of the holy wars, brought into Europe; for *admiral*, in the Arabian language, ſignifies a prince, or chief ruler, and was the ordinary title of the governors of cities, provinces, &c. and therefore they called the commander of the navy by that name, as a name of dignity and honour. And indeed there are no inſtances of admirals in any part of Europe before the year 1284, when Philip of France, who had attended St Lewis in the wars againſt the Saracens, created an admiral. Du Cange aſſures us, that the Sicilians were the firſt, and the Genoeſe the next, who gave the denomination of *Admiral* to the commanders of their naval armaments; and that they took it from the Saracen or Arabic *Emir*, a general name for every commanding officer. As for the exact time when the word was introduced in England, it is uncertain; ſome think it was in the reign of

Edward I.

Edward I. Sir Henry Spelman is of opinion that it was first used in the reign of Henry III. because neither the laws of Oleron made in 1266, nor Bracton, who wrote about that time, make any mention of it; and that the term *admiral* was not used in a charter in the eighth of Henry III. wherein he granted this office to Richard de Lacey, by these words *Maritimam Angliæ*; but in the 56th year of the same reign, not only the historians, but the charters themselves, very frequently use the word *admiral*.

Anciently there were generally three or four admirals appointed in the English seas, all of them holding the office *durante bene placito*: and each of them having particular limits under their charge and government: as admirals of the fleet of ships, from the mouth of the Thames northward, southward or westward. Besides these, there were admirals of the Cinque Ports, as in the reign of Edward III. when one William Latimer was styled *admiralis quinque portuum*; and we sometimes find that one person has been admiral of the fleets to the southward, northward, and westward: but the title of *admiralis Angliæ* was not frequent till the reign of Henry IV. when the king's brother had that title given him, which in all commissions afterwards was granted to the succeeding admirals. It may be observed, that there was a title above that of admiral of England, which was *locum-tenens regis super mare*, the king's lieutenant general of the sea; this title we find mentioned in the reign of Richard II.—Before the use of the word *admiral* was known, the title of *custos maris* was made use of.

Lord High ADMIRAL *of England*, in some ancient records called *capitanus maritimarum*, an officer of great antiquity and trust, as appears by the laws of Oleron, so denominated from the place they were made at by Richard I. The first title of *Admiral of England*, expressly conferred upon a subject, was given by patent of Richard II. to Richard Fitz-Allen, jun^r. earl of Arundel and Surrey; for those who before enjoyed this office were simply termed *admirals*, though their jurisdiction seems as large, especially in the reign of Edward III. when the court of admiralty was first erected.

This great officer has the management of all maritime affairs, and the government of the royal navy, with power of decision in all maritime cases both civil and criminal: he judges of all things done upon or beyond the sea, in any part of the world; upon the sea-coasts, in all ports and havens, and upon all rivers below the first bridge from the sea. By him, vice-admirals, rear-admirals, and all sea-captains are commissioned: all deputies for particular coasts, and coroners to view dead bodies found on the sea-coasts, or at sea; he also appoints the judges for his court of admiralty, and may imprison, release, &c. All ports and havens are *infra corpus comitatus*, and the admiral hath no jurisdiction of any thing done in them. Between high and low water mark, the common-law and the high-admiral have jurisdiction by turns, one upon the water, and the other upon the land.

The lord-admiral has power, not only over the seamen serving in his ships of war, but over all other seamen, to arrest them for the service of the state: and if any of them run away, without leave of the admiral, he hath power to make a record thereof, and certify the same to the sheriffs, mayors, bailiffs, &c. who shall cause them to be apprehended and imprisoned.

To the lord high-admiral belong all penalties and amercements of all transgressions at sea, on the sea-shore, in ports and havens, and all rivers below the first bridge from the sea; the goods of pirates and felons condemned or enslaved, sea-wrecks, goods floating on the sea, or cast on the shore (not granted to lords of manors adjoining to the sea), and a share of lawful prizes, also all great fishes, commonly called *royal fishes*, except whales and sturgeons: to which add, a salary of 7000*l.* a year.

In short, this is so great an office, in point of trust, honour, and profit, that it has been usually given to princes of the blood, or the most eminent persons among the nobility. There has been no high admiral for some years; the office being put in commission, or under the administration of the lords commissioners of the admiralty, who by statute have the same power and authority as the lord high admiral.

Lord High ADMIRAL *of Scotland*, one of the great officers of the crown, and supreme judge in all maritime cases within that part of Britain. See LAW, Part III. N° clvii. 15.

ADMIRAL, also implies the commander in chief of any single fleet or squadron, or, in general, any flag-officer whatever. The commander of a fleet carries his flag at the main-top-mast head.

Vice ADMIRAL, is the commander of the second squadron, and carries his flag at the fore-top-mast head.

Rear ADMIRAL, is the commander of the third squadron, and carries his flag at the mizen-top-mast head.

Vice ADMIRAL, is also an officer appointed by the lords commissioners of the admiralty. There are several of these officers established in different parts of Great-Britain, with judges and martials under them, for executing jurisdiction within their respective limits. Their decrees, however, are not final, an appeal lying to the court of admiralty in London.

ADMIRAL is also an appellation given to the most considerable ship of a fleet of merchant-men, or of the vessels employed in the cod-fishery of Newfoundland. This last has the privilege of choosing what place he pleases on the shore to dry his fish; gives proper orders, and appoints the fishing places to those who come after him; and as long as the fishing season continues, he carries a flag on his main-mast.

ADMIRAL, in zoology, the English name of a species of the voluta, a shell-fish belonging to the order of vermes testacea. See VOLUTA.

ADMIRALTY properly signifies the office of lord high-admiral, whether discharged by one single person, or by joint commissioners called *lords of the admiralty*.

Court of ADMIRALTY, is a sovereign court, held by the lord high-admiral, or lords of the admiralty, where cognizance is taken in all maritime affairs, whether civil or criminal. All crimes committed on the high-seas, or on the great rivers below the first bridge next the sea, are cognizable in this court only, and before which they must be tried by judge and jury. But in civil causes the mode is different, the decisions being all made according to the civil law. From the sentences of the admiralty-judge an appeal always lay, in ordinary course, to the king in chancery, as may be collected from statute 25 Hen. VIII. c. 19. which directs the appeal from the archbishop's courts to be determined by persons named in the king's commission, "like as in

"case

"case of appeal from the admiral-court." But this is also expressly declared by statute 8 Eliz. c 5. which enacts, that upon an appeal made to the chancery, the sentence definitive of the delegates appointed by commission shall be final.

Appeals from the vice-admiralty courts in America, and other plantations and settlements, may be brought before the courts of admiralty in England, as being a branch of the admiral's jurisdiction, tho' they may also be brought before the king in council. But in case of prize vessels, taken in time of war, in any part of the world, and condemned in any courts of admiralty or vice-admiralty as lawful prize, the appeal lies to certain *commissioners of appeals* consisting chiefly of the privy council, and not to judges delegates. And this by virtue of divers treaties with foreign nations, by which particular courts are established in all the maritime countries of Europe for the decision of this question, whether lawful prize or not? for this being a question between subjects of different states, it belongs entirely to the law of nations, and not to the municipal laws of either country, to detetermine it.

Court of ADMIRALTY in Scotland. See LAW, Part III. N° clvii. 15.

ADMIRALTY Islands, lie in about 2° 18′ S. Lat. and 16° 44′ E. long. There are between 20 and 30 islands said to be scattered about here, one of which alone would make a large kingdom. Captain Carteret, who first discovered them, was prevented touching at them, although their appearance was very inviting, on account of the condition of his ship, and of his being entirely unprovided with the articles of barter which suit an Indian trade. He describes them as clothed with a beautiful verdure of woods, lofty and luxuriant, interspersed with spots that have been cleared for plantations, groves of cocoa nut-trees, and houses of the natives, who seem to be very numerous. The largest of these islands is 18 leagues long in the direction of east and west. The discoverer thinks it highly probable that these islands produce several valuable articles of trade, particularly spices, as they lie in the same climate and latitude as the Moluccas.

ADMONITION, in ecclesiastical affairs, a part of discipline much used in the ancient church. It was the first act, or step, towards the punishment or expulsion of delinquents. In case of private offences, it was performed according to the evangelical rule, privately: in case of public offence, openly, before the church. If either of those sufficed for the recovery of the fallen person, all further proceedings in the way of censure ceased: if they did not, recourse was had to excommunication.

ADMONITIO Fustium, among the Romans, a military punishment, not unlike our whipping, only it was performed with vine-branches.

ADMORTIZATION, in the feudal customs, the reduction of the property of lands or tenements to mortmain. See MORTMAIN.

ADNATA, in anatomy, one of the coats of the eye, which is also called *conjunctiva* and *albuginea*.

ADNATA, is also used for any hair, wool, or the like, which grows upon animals or vegetables.

ADNATA, or *Adnascentia*, among gardeners, denote those off-sets, which, by a new germination under the earth, proceed from the lily, narcissus, hyacinth, and, other flowers, and afterwards grow to true roots. The French call them *cayeux*, "stalks."

ADNOUN, is used by some grammarians to express what we more usually call an Adjective. The word is formed by way of analogy to adverb; in regard adjectives have much the same office and relation to nouns that adverbs have to verbs. Bishop Wilkins uses the word *adname* in another sense, *viz.* for what we otherwise call a preposition.

ADOLESCENCE, the state of growing youth; or that period of a person's age commencing from his infancy, and terminating at his full stature or manhood. The word is formed of the Latin *adolescere*, to grow.—The state of adolescence lasts so long as the fibres continue to grow, either in magnitude or firmness. The fibres being arrived at the degree of firmness and tension sufficient to sustain the parts, no longer yield or give way to the efforts of the nutritious matter to extend them; so that their farther accretion is stopped, from the very law of their nutrition. Adolescence is commonly computed to be between 15 and 25, or even 30 years of age; though in different constitutions its terms are very different.——The Romans usually reckoned it from 12 to 25 in boys; and to 21 in girls, &c. And yet, among their writers, *juvenis* and *adolescens* are frequently used indifferently for any person under 45 years.

ADOLLAM, or ODOLLAM (anc. geog.), a town in the tribe of Judah, to the east of Eleutheropolis. David is said to have hid himself in a cave near this town, (Bible.)

ADON, a populous village in the province of Stuhl-Weissemberg, belonging to Hungary. It lies in a fruitful country, towards the river Danube. Long. 19. 20. Lat. 47. 30.

ADONAI, one of the names of the Supreme Being in the scriptures. The proper meaning of the word is *my lords*, in the plural number; as *Adoni* is *my lord*, in the singular. The Jews, who either out of respect, or superstition, do not pronounce the name of *Jehovah*, read *Adonai* in the room of it, as often as they meet with Jehovah in the Hebrew text. But the ancient Jews were not so scrupulous; nor is there any law which forbids them to pronounce the name of God. Calmet.

ADONIA, in antiquity, solemn feasts in honour of Venus, and in memory of her beloved Adonis. The Adonia were observed with great solemnity by most nations; Greeks, Phœnicians, Lycians, Syrians, Egyptians, &c. From Syria, they are supposed to have passed into India. The prophet Ezekiel* is understood to speak of them. They were still observed at Alexandria in the time of St Cyril; and at Antioch in that of Julian the apostate, who happened to enter that city during the solemnity, which was taken for an ill omen. The Adonia lasted two days: on the first of which certain images of Venus and Adonis were carried, with all the pomp and ceremonies practised at funerals; the women wept, tore their hair, beat their breasts, &c. imitating the cries and lamentations of Venus for the death of her paramour. This lamentation they called Ἀδωνιασμος. The Syrians were not contented with weeping, but gave themselves discipline, shaved their heads, &c. Among the Egyptians, the queen herself used to carry the image of Adonis in procession. St Cyril mentions an extraordinary ceremony practised by the Alexandaians: A letter was written to the women of Bybulus, to inform them that Adonis,

*Ch. viii. 14.

Adonis was found again: this letter was thrown into the ſea, which (it was pretended) did not fail punctually to convey it to Bybulus in ſeven days; upon the receipt of which, the Byblian women ceaſed their mourning, ſung his praiſes, and made rejoicings as if he were raiſed to life again: Or rather, according to Meurſius, the two offices of mourning and rejoicing made two diſtinct feaſts, which were held at different times of the year, the one ſix months after the other; Adonis being ſuppoſed to paſs half the year with Proſerpine, and half with Venus.—The Egyptian Adonia are ſaid to have been held in memory of the death of Oſiris; by others, of his ſickneſs and recovery. Biſhop Patrick dates their origin from the ſlaughter of the firſt-born under Moſes.

ADONIDES, in botany, a name given to botaniſts who deſcribed or made catalogues of plants cultivated in any particular place.

ADONIS, ſon to Cinyras king of Cyprus, the darling of the goddeſs Venus: being killed by a wild boar in the Idalian woods, he was turned into a flower of a blood-colour, ſuppoſed to be the Anemone. Venus was inconſolable; and no grief was ever more celebrated than this, moſt nations having perpetuated the memory of it by a train of anniverſary ceremonies*. Among Shakeſpeare's poems, is a long one on the ſubject of Venus's affection for Adonis.

*See *Adonia*.

The text of the vulgate in Ezekiel, viii. 14. ſays, that this prophet ſaw women ſitting in the temple, and weeping for Adonis: but according to the reading of the Hebrew text, they are ſaid to weep for Tammuz, or the *hidden one*. Among the Egyptians, Adonis was adored under the name of Oſiris the huſband of Iſis. But he was ſometimes called by the name of Ammuz, or Tammuz, *the concealed*, to denote probably his death or burial. The Hebrews, in deriſion, call him ſometimes the *dead*. Pſal. cvi. 28. and Lev. xix. 28. becauſe they wept for him, and repreſented him as one dead in his coffin; and at other times, they call him the image of jealouſy, Ezek. viii. 3. 5. becauſe he was the object of the god Mars's jealouſy. The Syrians, Phœnicians, and Cyprians called him Adonis, and F. Calmet is of opinion, that the Ammonites and Moabites gave him the name of Baal-peor. See Baal-peor.

Adonis, *Adonius*, (anc. geog.); a river of Phœnicia, riſing in Mount Lebanon, and falling into the ſea, after a north-weſt courſe, at Bybulus; famous in fable, as a beautiful ſhepherd youth, (Virgil;) ſon of Cynaras, king of the Cyprians, loved by Venus, ſlain by a boar, and turned into a river. Theocritus laments him dead in an idyllion, or rather ode, as did the women yearly, when in flood time, the river rolled down a red earth, which tinged its waters, deemed to be his wound bleeding afreſh. In the Phœnician language Adan ſignifies a willow, and Adon lord, with the ſame radical letters. Hence Ιταιος Αδωνις, Salignus, and Κυρις, or Κιρις Αδωνις, for Κυριος. Adonidis horti, are gardens beautifully arranged, but more adapted for pleaſure than profit.

Adonis, *Birds-eye*, or *Pheaſants-eye*; a genus of the polyandria order, belonging to the polygynia claſs of plants. It is aſſociated with the *Multiſiliquæ*, or 26th Nat. Order—The characters are: The *calyx* is a perianthium, conſiſting of five obtuſe concave leaves, ſomewhat coloured, and deciduous. The *corolla* has from five to fifteen oblong petals obtuſe and gloſſy. The *ſtamina* conſiſt of very numerous, ſhort, ſubulated filaments; the antheræ are oblong and inflected. The *piſtillum* has numerous germina collected in a head; no ſtyli; the ſtigmata acute and reflected. There is no *pericarpium*; the receptacle is oblong and ſpiked. The *ſeeds* are numerous, irregular, angular, gibbous at the baſe, reflected at the top, ſomewhat prominent, and awnleſs.

Species. The moſt remarkable ſpecies are the following: 1. The annua, or common adonis, is a native of Kent, where it is found in great plenty in the fields ſown with wheat. Its flowers are of a beautiful ſcarlet colour, and appear in the beginning of June; the ſeeds ripening in Auguſt and September. Great quantities of theſe flowers are ſold in London, under the name of Red Morocco. 2. The æſtivalis, or annual adonis, with yellow flowers, grows much taller than the firſt, has its leaves thinner ſet, and of a lighter colour. 3. The vernalis, or perennial adonis, grows naturally on the mountains of Bohemia, Pruſſia, and other parts of Germany. It flowers the latter end of March, or beginning of April; the ſtalks riſe about a foot and a half high; and when the roots are large, and have ſtood unremoved for ſome years, they will put out a great number of ſtalks from each root; on the top of each of theſe grows one large yellow flower. 4. The apennina, is a native of Siberia and the Appenines.

Culture. The firſt two ſpecies, being annual, muſt be propagated from ſeeds, which ought to be ſown in autumn, ſoon after they are ripe, or they will be in danger of not growing up that year. They thrive beſt in a light ſoil. The third and fourth ſpecies are likewiſe to be propagated from ſeeds, which muſt be ſown in autumn, or they ſeldom ſucceed. When the plants come up, they muſt be carefully kept clear from weeds; and in very dry weather their growth will be promoted by being now and then watered. They ſhould remain in the place where they are ſown till the ſecond year; and be tranſplanted thence in autumn, to the place where they are to remain.

ADONISTS, a ſect or party, among Divines and Critics, who maintain, that the Hebrew points ordinarily annexed to the conſonants of the word Jehovah, are not the natural points belonging to that word, nor expreſs the true pronunciation of it; but are the vowel-points, belonging to the words *Adonai* and *Elohim*, applied to the conſonants of the ineffable name Jehovah; to warn the readers, that inſtead of the word Jehovah, which the Jews were forbid to pronounce, and the true pronunciation of which had been long unknown to them, they are always to read *Adonai*. They are oppoſed to *Jehoviſts*: of whom the principal are Druſius, Capellus, Buxtorf, Alting, and Reland, who has publiſhed a collection of their writings on this ſubject.

ADOPTIANI, in church hiſtory, a ſect of ancient heretics, followers of Felix of Urgel, and Elipand of Toledo, who, towards the end of the eighth century, advanced the notion, that Jeſus Chriſt, in his human nature, is the ſon of God, not by nature, but by adoption.

ADOPTION, an act by which any one takes another into his family, owns him for his ſon, and appoints him for his heir.

The cuſtom of adoption was very common among the ancient Greeks and Romans: yet it was not practiſed;

Adoption. tiled, but for certain causes expressed in the laws, and with certain formalities usual in such cases. It was a sort of imitation of nature, intended for the comfort of those who had no children: wherefore he that was to adopt was to have no children of his own, and to be past the age of getting any; nor were eunuchs allowed to adopt, as being under an actual impotency of begetting children; neither was it lawful for a young man to adopt an elder, because that would have been contrary to the order of nature; nay, it was even required that the person who adopted should be eighteen years older than his adopted son, that there might at least appear a probability of his being the natural father.

Among the Greeks it was called υιοτης, *filiation*. It was allowed to such as had no issue of their own; excepting those who were not κυριοι εαυτων, *their own masters*, e. g. slaves, women, madmen, infants, or persons under twenty years of age; who being incapable of making wills, or managing their own estates, were not allowed to adopt heirs to them. Foreigners being incapable of inheriting at Athens, if any such were adopted, it was necessary first to make them free of the city. The ceremony of adoption being over, the adopted had his name enrolled in the tribe and ward of his new father; for which entry a peculiar time was allotted, viz. the festival θαργηλια. To prevent rash and inconsiderate adoptions, the Lacedemonians had a law, that adoptions should be transacted, or at least confirmed, in the presence of their kings. The children adopted were invested with all the privileges, and obliged to perform all the duties, of natural children; and being thus provided for in another family, ceased to have any claim of inheritance, or kindred, in the family which they had left, unless they first renounced their adoption; which, by the laws of Solon, they were not allowed to do, unless they had first begotten children, to bear the name of the person who had adopted them: thus providing against the ruin of families, which would otherwise have been extinguished by the desertion of those who had been adopted to preserve them. If the children adopted happened to die without children, the inheritance could not be alienated from the family into which they had been adopted, but returned to the relations of the adopter. It should seem, that by the Athenian law, a person, after having adopted another, was not allowed to marry without permission from the magistrate: in effect, there are instances of persons, who being ill used by their adoptive children, petitioned for such leave. However this be, it is certain some men married after they had adopted sons: in which case, if they begat legitimate children, their estates were equally shared between the begotten and adopted.

The Romans had two forms of adoption; one before the prætor; the other at an assembly of the people, in the times of the commonwealth, and afterwards by a rescript of the emperor. In the former, the natural father addressed himself to the prætor, declaring that he emancipated his son, resigned all his authority over him, and consented he should be translated into the family of the adopter. The latter was practised, where the party to be adopted was already free; and this was called *adrogation*. The person adopted changed all his names; assuming the prename, name, and surname of the person who adopted him.

Adoption. Besides the formalities prescribed by the Roman law, various other methods have taken place; which have given denominations to different species of adoption, among the Gothic nations, in different ages. As,

Adoption by arms, was when a prince made a present of arms to a person, in consideration of his merit and valour. Thus it was that the king of the Heruli was adopted by Theodoric; Athalaric by the emperor Justinian; and Cosroes, nephew of the king of Persia, by the emperor Justin.—The obligation here laid on the adoptive son was, to protect and defend the father from injuries, affronts, &c. And hence, according to Selden, the ceremony of dubbing knights took its origin as well as name.

Adoption by baptism, is that spiritual affinity which is contracted by god-fathers and god-children, in the ceremony of baptism. This kind of adoption was introduced into the Greek church, and came afterwards in use among the ancient Franks, as appears by the Capitulars of Charlemagne.

In reality, the god-father was so far considered as adoptive father, that his god-children were supposed to be intitled to a share in the inheritance of his estate.

Adoption by hair, was performed by cutting off the hair of a person, and giving it to the adoptive father. It was thus that pope John VIII. adopted Boson king of Arles; which perhaps is the only instance in history, of adoption, in the order of the ecclesiastics; a law that professes to imitate nature, not daring to give children to those in whom it would be thought a crime to beget any.

Adoption by matrimony, is the taking the children of a wife or husband, by a former marriage, into the condition of proper or natural children; and admitting them to inherit on the same footing with those of the present marriage. This is a practice peculiar to the Germans; among whom, it is more particularly known by the name of *einkindschaft*; among their writers in Latin, by that of *unio prolium*, or *union of issues*. But the more accurate writers observe, that this is no adoption. See Adfiliation.

Adoption by testament, that performed by appointing a person heir by will, on condition of his assuming the name, arms, &c. of the adopter. Of which kind we meet with several instances in the Roman history.

Among the Turks, the ceremony of adoption is performed by obliging the person adopted to pass through the shirt of the adopter. Hence, among that people, to adopt, is expressed by the phrase, *to draw another through my shirt*. It is said, that something like this has also been observed among the Hebrews; where the prophet Elijah adopted Elisha for his son and successor, and communicated to him the gift of prophecy, by letting fall his cloak or mantle on him. But adoption, properly so called does not appear to have been practised among the ancient Jews: Moses says nothing of it in his laws; and Jacob's adoption of his two grandsons, Ephraim and Manasseh, is not so properly an adoption, as a kind of substitution, whereby these two sons of Joseph were allotted an equal portion in Israel with his own sons.

Adoption is also used, in theology, for a federal act of God's free grace; whereby those who are regenerated by faith, are admitted into his household, and intitled to a ſhare in the inheritance of the kingdom of heaven.

ADOPTION is ſometimes alſo uſed, in ſpeaking of the ancient clergy, who had a cuſtom of taking a maid or widow into their houſes, under the denomination of *an adoptive*, or *ſpiritual ſiſter* or *niece*.

ADOPTION is alſo uſed in ſpeaking of the admiſſion of perſons into certain hoſpitals, particularly that of Lyons; the adminiſtrators whereof have all the power and rights of parents over the children admitted.

ADOPTION is alſo uſed for the reception of a new academy into the body of an old one.—Thus

The French academy of Marſeilles was adopted by that of Paris; on which account we find a volume of ſpeeches extant, made by ſeveral members of the academy of Marſeilles, deputed to return thanks to that of Paris for the honour.

In a ſimilar ſenſe, adoption is alſo applied by the Greeks, to the admitting a monk, or brother, into a monaſtic community: ſometimes called *ſpiritual adoption*.

ADOPTIVE, denotes a perſon or thing adopted by another.

Adoptive children, among the Romans, were on the ſame footing with natural ones; and accordingly were either to be inſtituted heirs, or expreſsly diſinherited, otherwiſe the teſtament was null. The emperor Adrian preferred adoptive children to natural ones; becauſe we chooſe the former, but are obliged to take the latter at random.

M. Menage has publiſhed a book of eloges, or verſes addreſſed to him; which he calls *Liber Adoptivus*, an adoptive book; and adds it to his other works.—Heinſus, and Furſtemburg of Munſter, have likewiſe publiſhed adoptive books.

In eccleſiaſtical writers we find adoptive women, or ſiſters, *(adoptivæ fœminæ*, or *ſorores,)* uſed for thoſe handmaids of the ancient clergy, otherwiſe called *ſubintroductæ*.

Adoptive arms are thoſe which a perſon enjoys by the gift or conceſſion of another, and to which he was not otherwiſe intitled. They ſtand contradiſtinguiſhed from arms of alliance.

We ſometimes meet with adoptive hair, by way of oppoſition to natural hair; and adoptive gods, by way of contradiſtinction to domeſtic ones. The Romans, notwithſtanding the number of their domeſtic, had their adoptive gods, taken chiefly from the Egyptians: ſuch were Iſis, Oſiris, Anubis, Apis, Harpocrates, and Canopus.

ADORATION, the act of rendering divine honours; or of addreſſing a being, as ſuppoſing it a god. The word is compounded of *ad* "to;" and *os, oris*, "mouth;" and literally ſignifies, to apply the hand to the mouth; *Manum ad os admovere, q. d.* "to kiſs the hand;" this being, in the eaſtern countries, one of the great marks of reſpect and ſubmiſſion.—The Romans practiſed adoration at ſacrifices, and other ſolemnities; in paſſing by temples, altars, groves, &c.; at the ſight of ſtatues, images, or the like, whether of ſtone or wood, wherein any thing of divinity was ſuppoſed to reſide. Uſually there were images of the gods placed at the gates of cities, for thoſe who went in or out, to pay their reſpects to.—The ceremony of adoration among the ancient Romans was thus: The devotee having his head *covered*, applied his right hand to his lips, the fore-finger reſting on his thumb, which was erect, and thus bowing his head, turned himſelf round from left to right. The kiſs thus given was called *oſculum labratum*; for ordinarily they were afraid to touch the images of their gods themſelves with their profane lips. Sometimes, however, they would kiſs their feet, or even knees, it being held an incivility to touch their mouths; ſo that the affair paſſed at ſome diſtance. Saturn, however, and Hercules, were adored with the head *bare;* whence the worſhip of the laſt was called *inſtitutum peregrinum*, and *ritus Græcanicus*, as departing from the cuſtomary Roman method, which was to ſacrifice and adore with the face veiled, and the cloths drawn up to the ears, to prevent any interruption in the ceremony by the ſight of unlucky objects.—The Jewiſh manner of adoration was by proſtration, bowing, and kneeling.—The Chriſtians adopted the Grecian rather than the Roman method, and adored always *uncovered*. The ordinary poſture of the ancient Chriſtians was kneeling, but on Sundays ſtanding: and they had a peculiar regard to the Eaſt, to which point they ordinarily directed their prayers.

ADORATION is more particularly uſed for the act of praying, or preferring our requeſts or thankſgivings to Almighty God.

ADORATION is alſo uſed for certain extraordinary civil honours or reſpects which reſemble thoſe paid to the Deity, yet are given to men.

The Perſian manner of *Adoration*, introduced by Cyrus, was by bending the knee, and falling on the face at the prince's feet, ſtriking the earth with the forehead, and kiſſing the ground. This ceremony, which the Greeks called προσκυνειν, Conon refuſed to perform to Artaxerxes, and Caliſthenes to Alexander the Great, as reputing it impious and unlawful.

The *Adoration* performed to the Roman and Grecian emperors conſiſted in bowing or kneeling at the prince's feet, laying hold of his purple robe, and preſently withdrawing the hand and clapping it to the lips. Some attribute the origin of this practice to Conſtantius. It was only perſons of ſome rank or dignity that were intitled to the honour. Bare kneeling before the emperor to deliver a petition, was alſo called *adoration*.

The practice of *adoration* may be ſaid to be ſtill ſubſiſting in England, in the ceremony of kiſſing the king's or queen's hand, and in ſerving them at table, both being performed kneeling.

ADORATION is more particularly uſed for kiſſing one's hand in preſence of another, as a token of reverence.—The Jews adored by kiſſing their hands and bowing down their heads; whence, in their language, *kiſſing* is properly uſed for *adoration*.

ADORATION is alſo uſed among Roman writers for a high ſpecies of applauſe given to perſons, who had ſpoken or performed well in public. (See ACCLAMATION.) We meet with adoration paid to orators, actors, muſicians, &c. The method of expreſſing it was, by riſing, putting both hands to their mouth, and then returning them towards the perſon intended to be honoured.

ADORATION is alſo uſed, in the court of Rome, for the ceremony of kiſſing the pope's feet.—The introduction of adoration among the Romans is aſcribed to the low flattery of Vitellius, who, upon the return of C. Cæſar from Syria, would not approach him otherwiſe than

than with his head covered, turning himself round, and then falling on his face. Heliogabulus restored the practice, and Alexander Severus again prohibited it. Dioclesian redemanded it; and it was, in some measure, continued under the succeeding princes, even after the establishment of Christianity, as Constantine, Constantius, &c. It is particularly said of Dioclesian, that he had gems fastened to his shoes, that divine honours might be more willingly paid him, by kissing his feet. The like usage was afterwards adopted by the popes, and is observed to this day. These prelates, finding a vehement disposition in the people to fall down before them and kiss their feet, procured crucifixes to be fastened on their slippers; by which stratagem, the adoration intended for the pope's person is supposed to be transferred to Christ. Divers acts of this adoration we find offered even by princes to the pope.

ADORATION is also used for a method of electing a pope. The election of popes is performed two ways; by *adoration* and by *scrutiny*. In election by adoration, the cardinals rush hastily, as if agitated by some spirit, to the adoration of some one among them, to proclaim him pope. When the election is carried by scrutiny, they do not adore the new pope till he is placed on the altar.

Barbarous ADORATION is a term used, in the laws of king Canute, for that performed after the manner of the heathens who adored idols. The Romish church is charged with the adoration of saints, martyrs, images, crucifixes, relics, the virgin, and the host; all which by Protestants are generally aggravated into idolatry, on a supposition, that the honour thus paid to them is absolute and supreme, called by way of distinction *Latria*, which is due only to God. Roman-catholics, on the contrary, explain them as only a relative or subordinate worship, called *Dulia* and *Hyperdulia*, which terminates ultimately in God alone. But may not the same be said of the idol-worship of the heathens? The Phœcinians adored the winds, on account of the terrible effects produced by them; the same was adopted by most of the other nations, Persians, Greeks, Romans, &c. The Persians chiefly paid their adorations to the sun and fire; some say also to rivers, the wind, &c. The motive of adoring the sun was the benefits they received from that glorious luminary, which of all creatures has doubtless the best pretensions to such homage.

ADOREA, in Roman antiquity, a word used in different senses; sometimes for all manner of grain, sometimes for a kind of cakes made of fine flour, and offered in sacrifice; and finally for a dole or distribution of corn, as a reward for some service; whence by metonymy it is put for praise or rewards in general.

ADOSCULATION, a term used by Dr Grew, to imply a kind of impregnation, without intromission; and in this manner he supposes the impregnation of plants is affected by the falling of the farina fœcundans on the pistil.

ADOSEE, in heraldry, signifies two figures or bearings being placed back to back.

ADOUR, the name of a river in France, which rises in the mountains of Bigorre, and running N. by Tarbes through Gascony, afterwards turns E, and, passing by Dax, falls into the bay of Biscay, below Bayonne.

ADOXA, TUBEROUS MOSCHATEL, HOLLOW-ROOT, or INGLORIOUS; a genus of the tetragynia order, belonging to the octandria class of plants. In the natural method it belongs to the 13th order, or *Succulentæ*.—The characters of this genus are: The *calyx* is a perianthium beneath, divided into two segments, flat, persistent. The *corolla* is composed of one flat petal, divided into four ovate acute segments longer than the calyx. The *stamina* consist of eight subulated filaments the length of the calyx; with roundish antheræ. The *pistillum* has a germen beneath the receptacle of the corolla; four simple, erect, persistent styli, the length of the stamina; and simple stigmata. The *pericarpium* is a globular four-celled berry between the calyx and the corolla. The *seeds* are solitary and compressed.

There is but one species, which is a native of the woods in Britain, and several parts of Europe: it is a very low plant, seldom rising more than four or five inches high; the leaves resemble those of bulbous fumitory; the flower-stalk arises immediately from the root, on the top of which grow four or five small flowers of an herbaceous white colour, which appear in the beginning of April, and the berries ripen in May, soon after which, the leaves decay. The herb may be procured by transplanting the roots any time after the leaves decay, till winter. They must be planted in the shade, under shrubs; for they will not thrive if exposed to the sun. The leaves and flowers smell like musk, from whence it has by some been called *musk-crowfoot*.

AD PONDUS OMNIUM, among physicians, on abbreviation in their prescriptions, signifying that the last mentioned ingredient is to weigh as much as all the rest together.

AD QUOD DAMNUM, in the English law, a writ directed to the sheriff, commanding him to inquire into the damage which may befal from granting certain privileges to a place, as a fair, a market, or the like.

ADRACHNE, in botany, a species of the strawberry-tree. See ARBUTUS.

ADRAMELECH, one of the gods of the inhabitants of Sepharvaim, who were settled in the country of Samaria, in the room of those Israelites who were carried beyond the Euphrates. The Sepharvaites made their children pass through the fire, in honour of this idol and another called *Anamelech*. It is supposed, that Adrammelech meant the sun, and Anamelech the moon: the first signifies *the magnificent king*; the second *the gentle king*.

ADRAMYTTIUM (anc. geog.), now *Andramiti*; a town of Mysia Major, at the foot of mount Ida, an Athenian colony, with a harbour and dock near the Caicus. *Adramyttenus* the epithet; as *Adramyttenus Sinus*, a part of the Egean Sea, on the coast of Mysia; *Adramyttenus Convenus*, sessions or assizes. The eighth in order of the nine *Conventus Juridici* of the province of Asia.

ADRANA, a river of Germany, (Polybius): now the Eder, rising on the borders of the county of Nassau, to the North-east of, and not far from Dillenburg, running through the landgraviate of Hesse, the county of Waldeck, by Fritzlar, and then again through the landgraviate, and, together with the Fulda, falling into the Weser, to the south of, and not far from Cassel.

ADRANUM, or HADRANUM, (anc. geog.), now *Aderno*; a town of Sicily, built by the elder Dionysius, Adrastea | Adrianum.

at the foot of mount Ætna, (Diodorus Siculus), four hundred years before Christ. So called from the temple of Adranus, or Hadranus, a god much worshipped by the Sicilians; with a river of the same name, (Stephanus,) now *Fiume d'Aderno*. The inhabitants, *Hadranitani*, and *Adranitæ*.

ADRASTEA, in antiquity, an epithet given to the goddess Nemesis, or Revenge. It was taken from king Adrastus, who first erected a temple to that deity.

ADRASTIA *Certamina*, in antiquity, a kind of Pythian games, instituted by Adrastus king of Argos, in the year of the world 2700, in honour of Apollo, at Sicyon. These are to be distinguished from the Pythian games celebrated at Delphi.

ADRASTUS, king of Argos, son of Talaus and Lysianissa, daughter of Polybius king of Sicyon, acquired great honour in the famous war of Thebes, in support of Polynices his son-in-law, who had been excluded the sovereignty of Thebes by Eteocles his brother, notwithstanding their reciprocal agreement. Adrastus, followed by Polynices and Tydeus his other son-in-law, by Capaneus and Hippomedon his sister's sons, by Amphiaraus his brother-in-law, and by Parthenopæus, marched against the city of Thebes; and this is the expedition of the Seven Worthies, which the poets have so often sung. They all lost their lives in this war, except Adrastus, who was saved by his horse called Arion. This war was revived ten years after by the sons of those deceased warriors, which was called the war of the Epigones, and ended with the taking of Thebes. None of them lost their lives except Ægialeus son of Adrastus; which afflicted him so much that he died of grief in Megara, as he was leading back his victorious army.

ADRAZZO, or AJACCIO. The same with ADJAZZO.

ADRIA, or HADRIA (anc. geog.), the name of two towns in Italy. One in the country of the Veneti, on the river Tartarus, between the Padus and the Athesis, called *Atria* by Pliny and Ptolemy, but *Adrias* by Strabo. Another on the river Vomanus, in the territory of the Piceni, (to which Antonine's Itinerary from Rome is directed), the country of the ancestors of the emperor Adrian. From which of these the Adriatic sea is denominated, is matter of doubt. A third opinion is, that it is so called from Adrias the son of Joan, of Italian origin; (Eustathius in Dionysium.)

ADRIANUM (or ADRIATICUM) MARE (anc. geog.), now the gulf of Venice, a large bay in the Mediterranean, between Dalmatia, Sclavonia, Greece, and Italy. It is called by the Greeks, Αδριας κολπος; and *Adria* by the Romans, (as *Arbiter Adriæ Notus*, Hor.) Cicero calls it *Hadrianum Mare;* Virgil has *Hadriaticas Undas*. It is commonly called *Mare Adriaticum*, without an aspiration; but whether it ought to have one, is a dispute: if the appellation is from *Hadria*, the town of the Piceni, it must be written *Hadriaticum*, because the emperor's name, who thence derives his origin, is on coins and stones *Hadrianus*; but if from the town in the territory of Venice, as the more ancient, and of which that of the Piceni is a colony, this will justify the common appellation *Adriaticum*.

Adrian.

ADRIAN, or HADRIAN, (Publius Ælius), the Roman emperor. He was born at Rome the 24th of January, in the 76th year of Christ. His father left him an orphan, at ten years of age, under the guardianship of Trajan, and Cœlius Tatianus a Roman knight. He began to serve very early in the armies, having been tribune of a legion before the death of Domitian. He was the person chosen by the army of Lower Mœsia, to carry the news of Nerva's death to Trajan, successor to the empire. He accompanied Trajan in most of his expeditions, and particularly distinguished himself in the second war against the Daci; and having before been quæstor, as well as tribune of the people, he was now successively prætor, governor of Pannonia, and consul. After the siege of Atra in Arabia was raised, Trajan, who had already given him the government of Syria, left him the command of the army; and at length, when he found death approaching, it is said he adopted him. Adrian, who was then in Antiochia, as soon as he received the news thereof, and of Trajan's death, declared himself emperor, on the 11th of August, 117. No sooner had he arrived at the imperial dignity, then he made peace with the Persians, to whom he yielded up a great part of the conquests of his predecessors; and from generosity, or policy, he remitted the debts of the Roman people, which, according to the calculation of those who have reduced them to modern money, amounted to 22,500,000 golden crowns; and he burnt all the bonds and obligations relating to those debts, that the people might be under no apprehensions of being called to an account for them afterwards. There are medals in commemoration of this fact, in which he is represented holding a flambeau in his hand, to set fire to all those bonds which he had made void. He went to visit all the provinces; and did not return to Rome till the year 118, when the senate decreed him a triumph, and honoured him with the title of Father of his country; but he refused both, and desired that Trajan's image might triumph. No prince travelled more than Adrian; there being hardly one province in the empire which he did not visit. In 120 he went into Gaul; from thence he went over to Britain, in order to subdue the Caledonians, who were making continual inroads into the provinces. Upon his arrival they retired towards the north: he advanced however as far as York, where he was diverted from his intended conquest by the description some old soldiers he found there, who had served under Agricola, gave him of the country. In hopes, therefore, of keeping them quiet by enlarging their bounds, he delivered up to the Caledonians all the lands lying between the two Friths and the Tyne; and at the same time, to secure the Roman provinces from their future incursions, built the famous wall which still bears his name (A). Having thus settled

(A) This work, though called by the Roman historians *murus*, which signifies a wall of stone, was only composed of earth covered with green turf. It was carried on from the Solway Frith, a little west of the village of Burgh on the Sands, in as direct a line as possible, to the river Tyne on the east, at the place where the

Adrian.

tled matters in Britain, he returned to Rome, where he was honoured with the title of Restorer of Britain, as appears by some medals. He soon after went into Spain, to Mauritania, and at length into the East, where he quieted the commotions raised by the Parthians. After having visited all the provinces of Asia, he returned to Athens in 125, where he passed the winter, and was initiated in the mysteries of Eleusinian Ceres. He went from thence to Sicily, chiefly to view mount Ætna, contemplate its phenomena, and enjoy the beautiful and extensive prospect afforded from its top. He returned to Rome the beginning of the year 129; and, according to some, he went again, the same year, to Africa; and, after his return from thence, to the East. He was in Egypt in the year 132, revisited Syria the year following, returned to Athens in 134, and to Rome in 135. The persecution against the Christians was very violent under his reign; but it was at length suspended, in consequence of the remonstrances of Quadrat bishop of Athens, and Aristides, two Christian philosophers, who presented the emperor with some books in favour of the Christian religion. He conquered the Jews; and, by way of insult, erected a temple to Jupiter on Calvary, and placed a statue of Adonis in the manger of Bethlehem; he caused also the images of swine to be engraven on the gates of Jerusalem. At last he was seized with a dropsy, which vexed him to such a degree, that he became almost raving mad. A great number of physicians were sent for, and to the multitude of them he ascribed his death. He died at Baiæ in the 63d year of his age, having reigned 21 years. The Latin verses (B) he addressed to his soul have been much criticised and variously interpreted. There are some fragments of his Latin poems extant, and there are Greek verses of his in the Anthology. He also wrote the history of his own life: to which, however, he did not chuse to put his name; but that of Phlegon, one of his freed-men, a very learned person, was prefixed to it*. He had great wit, and an extensive memory. He understood the sciences perfectly well; but was very jealous of others who excelled in them. He was also cruel, envious, and lascivious. Antoninus his successor obtained his apotheosis; and prevented the rescission of his acts, which the senate once intended.

* Vide *Spartan, in Adriano.*

ADRIAN IV. (Pope), the only Englishman who ever had the honour of sitting in the papal chair. His name was Nicholas Brekespere; and he was born at Langley, near St Alban's, in Hertfordshire. His father having left his family, and taken the habit of the monastery of St Alban's, Nicholas was obliged to submit to the lowest offices in that house for daily support. After some time, he desired to take the habit in that monastery, but was rejected by the abbot Richard. Upon this he resolved to try his fortune in another country, and accordingly went to Paris; where, though in very poor circumstances, he applied himself to his studies with great assiduity, and made a wonderful proficiency. But having still a strong inclination to a religious life, he left Paris, and removed to Provence, where he became a regular clerk in the monastery of St Rufus. He was not immediately allowed to take the habit; but passed some time, by way of trial, in recommending himself to the monks by a strict attention to all their commands. This behaviour, together with the beauty of his person, and prudent conversation, rendered him so acceptable to those religious, that after some time they intreated him to take the habit of the canonical order. Here he distinguished himself so much by his learning and strict observance of the monastic discipline, that, upon the death of the abbot, he was chosen superior of that house; and we are told that he rebuilt that convent. Pope Eugenius III. being apprised of the great merit of Nicholas, and thinking he might be serviceable to the church in a higher station, created him cardinal-bishop of Alba in 1146. In 1148, his Holiness sent him legate to Denmark and Norway; where, by his fervent preaching and diligent instructions, he converted those barbarous nations to the Christian faith; and erected Upsal

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the town of Newcastle now stands; so that it must have been above 60 English, and near 70 Roman miles in length. It consisted of four parts: 1. The principal *agger*, mound of earth, or rampart, on the brink of the ditch. 2. The ditch on the north side of the rampart. 3. Another rampart on the south side of the principal one, about five paces distant from it. 4. A large rampart on the north side of the ditch.—This last was probably the military way to the line of forts on this work: it was so to those formerly built by Agricola; and if it did not serve the same purpose in this, there must have been no military way attending it.—The south rampart might serve for an inner defence in case the enemy should beat them from any part of the principal rampart, or it might be designed to protect the soldiers from any sudden attack of the provincial Britons.—For many ages, this work hath been in so ruinous a condition, that it is impossible to discover its original dimensions with certainty. From their appearance, it seems probable that the principal rampart was at least 10 or 12 feet high, and the south one not much less; but the north one was considerably lower. From the dimensions of the ditch taken as it passes through a lime-stone quarry near Harlow-hill, it appears to have been 9 feet deep, and 11 wide at the top, but somewhat narrower at the bottom. The north rampart was about 20 feet distant from the ditch.

(B) The verses are these:

Animula vagula, blandula,
Hospes, comesque corporis,
Quæ nunc, abibis in loca
Pallidula, rigida, nudula,
Nec, ut soles, dabis jocos?

Thus translated by Mr Pope:

Ah! fleeting spirit! wand'ring fire,
That long hast warm'd my tender breast,
Must thou no more this frame inspire?
No more a pleasing cheerful guest?
Whither, ah whither art thou flying?
To what dark undiscover'd shore?
Thou seem'st all trembling, shiv'ring, dying,
And wit and humour are no more!

ſal into an archiepiſcopal ſee. When he returned to Rome, he was received by the pope and cardinals with great marks of honour: and Pope Anaſtaſius, who ſucceeded Eugenius, happening to die at this time, Nicholas was unanimouſly choſen to the holy ſee, in November 1154, and he took the name of *Adrian*. When the news of his promotion reached England, King Henry II. ſent Robert abbot of St Alban's, and three biſhops, to Rome, to congratulate him on his election; upon which occaſion Adrian granted very conſiderable privileges to the monaſtery of St Alban's, particularly an exemption from all epiſcopal juriſdiction, excepting to the ſee of Rome. Adrian, in the beginning of his pontificate, boldly withſtood the attempts of the Roman people to recover their ancient liberty under the conſuls, and obliged thoſe magiſtrates to abdicate their authority, and leave the government of the city to the pope. In 1155, he drove the heretic Arnaud of Breſſe, and his followers, out of Rome. The ſame year he excommunicated William king of Sicily who ravaged the territories of the church, and abſolved that prince's ſubjects from their allegiance. About the ſame time, Frederic king of the Romans, having entered Italy with a powerful army, Adrian met him near Sutrium, and concluded a peace with him. At this interview, Frederic conſented to hold the pope's ſtirrup whilſt he mounted on horſeback. After which, his holineſs conducted that prince to Rome, and in St Peter's church placed the imperial crown on his head, to the great mortification of the Roman people, who aſſembled in a tumultuous manner, and killed ſeveral of the Imperialiſts. The next year a reconciliation was brought about between the pope and the Sicilian king, that prince taking an oath to do nothing farther to the prejudice of the church, and Adrian granting him the title of *king of the two Sicilies*. He built and fortified ſeveral caſtles, and left the papal dominions in a more flouriſhing condition than he found them. But notwithſtanding all his ſucceſs, he was extremely ſenſible of the diſquietudes attending ſo high a ſtation; and declared to his countryman John of Saliſbury, that all the former hardſhips of his life were mere amuſement to the misfortunes of the popedom: that he looked upon St Peter's chair to be the moſt uneaſy ſeat in the world; and that his crown ſeemed to be clapped burning on his head*. He died September 1. 1159, in the fourth year and tenth month of his pontificate; and was buried in St Peter's church, near the tomb of his predeceſſor Eugenius. There are extant ſeveral letters, and ſome homilies, written by Pope Adrian.

* Baronius Annal. tom xii. an. 1154

ADRIAN, cardinal-prieſt, of the title of St Chryſogonus, was a native of Cornetto in Tuſcany. Innocent VIII. ſent him nuncio into Scotland and into France; and after he had been clerk and treaſurer of the apoſtolic chamber, pope Alexander VI. whoſe ſecretary he had been, honoured him with the cardinal's hat. His life was a continued ſcene of odd alterations. He narrowly eſcaped death the day Alexander VI. poiſoned himſelf by miſtake. Afterward he drew upon himſelf the hatred of Julius II. ſo that he was obliged to go and hide himſelf in the mountains of Trent. Having been recalled by Leo X. he was ſo ungrateful, that he engaged in a conſpiracy againſt him. The pope pardoned this fault: but the cardinal, not caring to truſt to this, made his eſcape, and it could never be known exactly what was become of him. He was one of the firſt that effectually reformed the Latin ſtyle. He ſtudied Cicero with great ſucceſs, and made many excellent obſervations on the propriety of the Latin tongue. The treatiſe he compoſed *De ſermone Latino*, is a proof of this. He had begun a Latin tranſlation of the Old Teſtament. He wrote *De vera philoſophia*: This treatiſe was printed at Cologn 1548.

ADRIAN VI. (Pope), was born at Utrecht in 1459. His father was not able to maintain him at ſchool, but he got a place at Louvain, in a college in which a certain number of ſcholars were maintained *gratis*. It is reported that he uſed to read in the night-time by the light of the lamps in the churches or ſtreets. He made a conſiderable progreſs in all the ſciences; led an exemplary life; and there never was a man leſs intriguing and forward than he was. He took his degree of doctor of divinity at Louvain; was ſoon after made canon of St Peter's, and profeſſor of divinity at Utrecht, and then dean of St Peters and vice-chancellor of the univerſity. He was obliged to leave an academic life, to be tutor to the archduke Charles. This young prince made no great progreſs under him: however, never was a tutor more conſiderably rewarded; for it was by Charles V.'s credit he was raiſed to the papal throne. Leo X. had given him the cardinal's hat in 1517. After this pope's death, ſeveral cabals in the conclave ended in the election of Adrian, with which the people of Rome were very much diſpleaſed. He would not change his name, and in every thing he ſhowed a great diſlike for all oſtentation and ſenſual pleaſures, though ſuch an averſion had been long ago out of date. He was very partial to Charles V. and did not enjoy much tranquillity under the triple crown. He lamented much the wicked morals of the clergy, and wiſhed to eſtabliſh a reformation of manners among them. He died Sept. 14. 1523.

ADRIANI (Joanni Batiſta), was born of a patrician family at Florence, in 1511. He wrote a Hiſtory of his own Times in Italian; which is a continuation of Guicciardini, beginning at the year 1536; to which Thuanus acknowledges himſelf greatly indebted: beſide which, he compoſed ſix funeral orations, on the emperor Charles V. and other noble perſonages; and is thought to have been the author of a long letter on ancient painters and ſculptors, prefixed to the third volume of Vaſari. He died at Florence in 1579.

ADRIANISTS, in eccleſiaſtical hiſtory, a ſect of heretics divided into two branches; the firſt were diſciples of Simon Magus, and flouriſhed about the year 34. Theodoret is the only perſon who has preſerved their name and memory; but he gives us no account of their origin. Probably this ſect, and the ſix others which ſprung from the Simonians, took their name from the particular diſciples of Simon. The ſecond were the followers of Adrian Hamſtead, the anabaptiſt; and held ſome particular errors concerning Chriſt.

ADRIANOPLE, a city of Turkey in Europe, in the province of Romania, and the ſee of an archbiſhop under the patriarch of Conſtantinople. It is about ſeven or eight miles in circumference, including the old city and ſome gardens. The moſques and other public buildings are built of ſtone, and are very elegant: but

but private houses in general are meanly built; and the streets are exceeding dirty. The walls and towers are in a great measure fallen to decay. However, there is a beautiful bazar, or market, half a mile long, called Ali Baňa. It is a vast arched building, with six gates, and 365 well-furnished shops, kept by Turks, Armenians, and Jews, who pay five crowns a-month for each shop. The number of inhabitants of all nations and religions may be about 100,000: provisions are plenty, and living cheap. The air is wholesome, and the country very pleasant in summer, on account of the river and streams that run near and about the city; the chief of which is the Mariza. These promote and preserve the verdure of the gardens, meadows, and fields, for a considerable part of the year. In the winter there is plenty of game. Near the principal bazar there is another, about a mile in length, covered with boards, with holes on each side to let in the light. It is full of good shops, which contain all kinds of commodities. Sultan Selim's mosque stands on the side of a hill, in the midst of the city; and hence this magnificent structure may be seen on all sides. Every thing made of gold and silver, jewels, pistols, scimetars, &c. are sold in another part of the city, called by travellers the *bizestein*, though it differs little from a bazar. This contains about 200 shops, and is covered like the former: but the covering is supported by two rows of large pillars. The grand visier's palace is nothing more than a covenient house, after the Turkish manner of building. The emperor's seraglio is a regular structure, in a plain near the river Tungia. It is two miles in compass, and has seven gates, besides those of the gardens, which are several miles in circumference. The city is governed by a mullah cadi, who has an absolute authority both in civil and criminal matters. In the time of the plague, or war, the grand signior has sometimes resided here. The Turks took this city from the Greeks in 1362, and made it the capital of the empire, till Mahomet II. took Constantinople in 1453. E. Long. 26. 27. Lat. 41. 41.

ADROGATION, in Roman antiquities, a species of adoption, whereby a person who was capable of choosing for himself was admitted by another into the relation of a son. The word is compounded of *ad*, "to," and *rogare*, "to ask," on account of a question put in the ceremony of it, whether the adopter would take such a person for his son? and another to the adoptive, whether he consented to become such a person's son?

ADSIDELLA, in antiquity, the table at which the flamens sat during the sacrifices.

ADSTRICTION, among physicians, a term used to denote the rigidity of any part.

ADUACA, or ATUACA, anciently a large and famous city of the Tungri; now a small and inconsiderable village, called *Tongeren*, in the bishopric of Liege, to the north-west of the city of Liege, in the territory of Haspengow, on the rivulet Jecker, that soon after falls into the Maese. E. Long. 5. 52. Lat. 50. 54.

ADVANCE, in the mercantile style, denotes money paid before goods are delivered, work done, or business performed.

ADVANCED, in a general sense, denotes something posted or situated before another. Thus,

ADVANCED Ditch, in fortification, is that which surrounds the glacis or esplanade of a place.

ADVANCED Guard, or *Vanguard*, in the art of war, the first line or division of an army, ranged or marching in order of battle; or, it is that part which is next the enemy, and marches first towards them.

Advanced Guard, is more particularly used for a small party of horse stationed before the main-guard.

ADVANCER, among sportsmen, one of the starts or branches of a buck's attire, between the back antler and the palm.

ADUAR, in the Arabian and Moorish customs, a kind of ambulatory village, consisting of tents, which these people remove from one place to another, as suits their conveniency.

ADVENT, in the calendar, properly signifies the approach of the feast of the nativity. It includes four Sundays, which begin on St Andrew's day, or on the Sunday before or after it. During advent, and to the end of the octaves of epiphany, the solemnizing of marriage is forbid without a special licence. It is appointed to employ the thoughts of Christians on the first advent or coming of Christ in the flesh, and his second advent or coming to judge the world. The primitive Christians practised great austerity during this season.

AD VENTREM INSPICIENDUM, in law, a writ by which a woman is to be searched whether she be with child by a former husband, on her with-holding of lands from the next, failing issue of her own body.

ADVENTURE, in a general sense, some extraordinary or accidental event. It also denotes a hazardous or difficult undertaking.

Bill of ADVENTURE, among merchants, a writing signed by a merchant, testifing the goods mentioned in it to be shipped on board a certain vessel belonging to another person, who is to run all hazards; the merchant only obliging himself to account to him for the produce.

ADVENTURE-Bay, in Van Diemen's land. There is a beautiful sandy beach*, about two miles long, at the bottom of Adventure Bay, formed to all appearance by the particles which the sea washes from a fine white sand-stone. This beach is very well adapted for hauling a seine. Behind it is a plain, with a brackish lake, out of which we caught, by angling, some bream and trout. The parts adjoining the bay are mostly hilly, and are an entire forest of tall trees, rendered almost impassable by breaks of fern, shrubs, &c. The soil on the flat land, and on the lower part of the hills, is sandy, or consists of a yellowish earth, and in some parts of a reddish clay; but further up the hills, it is of a grey tough cast. This country, upon the whole, bears many marks of being very dry, and the heat appears to be great. No mineral bodies, nor stones of any other kind but the white sand-stone, were observed by us; nor could we find any vegetables that afforded subsistence for man. The forest-trees are all of one kind, and generally quite straight: they bear clusters of small white flowers. The principal plants observed, are wood-sorrel, milk-wort, cudweed, bell-flower, gladiolus, samphire, and several kinds of fern: the only quadruped, a species of opossum, about twice the size of a large rat. The kangooroo, found further northward in New Holland, may also be supposed to inhabit here, as some of the inhabitants had pieces of the skin of that animal.

* Cook's last voyage B. i. ch. 6.

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The principal sorts of birds in the woods are brown hawks or eagles, crows, large pigeons, yellowish paroquets, and a species which we called *motacilla cyanea*, from the beautiful azure colour of its head and neck. On the shore were several gulls, black oyster-catchers, or sea-pies, and plovers of a stone-colour.

The inhabitants seemed mild and cheerful, with little of that wild appearance that savages in general have. They are almost totally devoid of personal activity or genius, and are nearly upon a par with the wretched natives of Terra del Fuego. They display, however, some contrivance in their method of cutting their arms and bodies in lines of different directions, raised above the surface of the skin. Their indifference for presents, their general inattention, and want of curiosity, were very remarkable, and testified no acuteness of understanding. Their complexion is a dull black, which they sometimes heighten by smutting their bodies, as was supposed, from their leaving a mark behind on any clean substance. Their hair is perfectly woolly, and is clotted with grease and red ochre, like that of the Hottentots. Their noses are broad and full, and the lower part of the face projects considerably. Their eyes are of a moderate size, and though they are not very quick or piercing, they give the countenance a frank, cheerful, and pleasing cast. Their teeth are not very white, nor well set, and their mouths are too wide: they wear their beards long, and clotted with paint. They are, upon the whole, well proportioned, though their belly is rather protuberant. Their favourite attitude is to stand with one side forward, and one hand grasping, across the back, the opposite arm, which, on this occasion, hangs down by the side that projects.

ADVENTURER, in a general sense, denotes one who hazards something.

ADVENTURERS, is particularly used for an ancient company of merchants and traders, erected for the discovery of lands, territories, trades, &c. unknown. The society of adventurers had its rise in Burgundy, and its first establishment from John Duke of Brabant in 1248, being known by the name of *The brotherhood of St Thomas a Becket*. It was afterwards translated into England, and successively confirmed by Edward III. and IV. Richard III. Henry IV. V. VI. and VII. who gave it the appellation of *Merchant Adventurers*.

ADVERB, in grammar, a particle joined to a verb, adjective, or participle, to explain their manner of acting or suffering; or to mark some circumstance or quality signified by them. The word is formed from the preposition *ad*, "to," and *verbum*, "a verb;" and signifies literally a word joined to a verb, to show how, when, or where, one is, does, or suffers; as, the boy, paints *neatly*, writes *ill*; the house stands *there*, &c. See GRAMMAR.

ADVERSARIA, among the ancients, a book of accounts, not unlike our journals or day-books. It is more particularly used for a kind of common-place-book. See COMMON-PLACE-BOOK.

ADVERSATIVE, in grammar, a word expressing some difference between what goes before and what follows it. Thus, in the phrase, *he is an honest man, but a great enthusiast*, the word *but* is an adversative conjunction.

ADVERSATOR, in antiquity, a servant who attended the rich in returning from supper, to give them notice of any obstacles in the way, at which they might be apt to stumble.

ADVERTISEMENT, in a general sense, denotes any information given to persons interested in an affair; and is more particularly used for a brief account of an affair inserted in the public papers, for the information of all concerned.

ADULA (anc. geog.), a mountain in Rhætia, or the country of the Grisons, part of the Alps, in which are the fountains of the Rhine; now *St Godhards*.

ADULE, or ADULIS, (anc. geog.) a town of Egypt built by fugitive slaves, distant from its port on the Red Sea 20 stadia. Pliny calls the inhabitants *Adulitae*. The epithet is either *Adulitanus*; as, *Monumentum Adulitanum*, on the pompous inscription of the statue of Ptolemy Euergetes, published by Leo Alatius at Rome in 1631, and to be found in Spon and Thevenot: Or, *Adulicus*; as *Adulicus Sinus*, a part of the Red Sea.

ADULT, an appellation given to any thing that is arrived at maturity: Thus we say, an adult person, an adult plant, &c. Among civilians, it denotes a youth between 14 and 25 years of age.

ADULTERER, a man who commits adultery. See ADULTERY.

ADULTERESS, a woman guilty of ADULTERY. An adulteress, by the English law, undergoes no temporal punishment whatever, except the loss of her dower; and she does not lose even that, if her husband is weak enough to be reconciled to her, and cohabit with her after the offence committed. 13 Ed. I. cap. 34.

But it is to be observed, that adulteresses are such either by the canon or civil law. According to the former, a woman is an adulteress who, either being herself married, converses carnally with another man; or being single herself, converses with a man that is married. According to the latter, she is not an adulteress, if she be not herself in the married state, though she converses with a man that is. The crime, in this case, was more properly called *stuprum* than *adulterium*. Hence, among the Romans, the word *adultera* "adulteress," differed from *pellex*, which denoted a single woman who cohabited with a married man, and *pellex* differed from *concubina* which signified her who had only intercourse with an unmarried man. The former was reputed infamous, and the latter innocent.

ADUTERATION, the act of debasing, by an improper mixture, something that was pure and genuine.

The word is Latin, formed of the verb *adulterare*, "to corrupt," by mingling something foreign to any substance. There are in England laws against the adulteration of coffee, tea, tobacco, snuff, wine, beer, bread, wax, hair-powder, &c.

ADULTERATION of Coin, properly imports the making, or casting of a wrong metal, or with too base or too much alloy.

Adulterations of coins are effected divers ways; as, by forging another stamp or inscription; by mixing impure metals with the gold or silver: most properly, by making use of a wrong metal, or an undue alloy, or too great an admixture of the baser metals with gold or silver. Counterfeiting the stamp, or clipping and

and lessening the weight, do not so properly come under the denomination of *adulterating*.—Evelyn gives rules and methods, both of adulterating and detecting adulterated metals, &c.— *Adulterating* is somewhat less extensive than *debasing*, which includes diminishing, clipping, &c.

To adulterate or debase the current coin, is a capital crime in all nations.—The ancients punished it with great severity: among the Egyptians both hands were cut off; and by the civil law, the offender was thrown to wild beasts. The emperor Tacitus enacted, that counterfeiting the coin should be capital; and under Constantine it was made treason, as it is also among us. The adulterating of gems is a curious art, and the methods of detecting it no less useful. Nichols Lapid. p. 18.

ADULTERINE, in the civil law, is particularly applied to a child issued from an adulterous amour or commerce. Adulterine children are more odious than the illegitimate offspring of single persons.—The Roman law even refuses them the title of natural children; as if nature disowned them.—Adulterine children are not easily dispensed with for admission to orders. Those are not deemed adulterine, who are begotten of a woman openly married, through ignorance of a former wife being alive. By a decree of the parliament of Paris, adulterine children are declared not legitimated by the subsequent marriage of the parties, even though a papal dispensation be had for such marriage, wherein is a clause of legitimation.

Adulterine Marriages, in St Augustine's sense, denote second marriages, contracted after a divorce.

ADULTERY, an unlawful commerce between one married person and another, or between a married and unmarried person.

Punishments have been annexed to adultery in most ages and nations, though of different degrees of severity. In many it has been capital; in others venial, and attended only with slight pecuniary mulcts. Some of the penalties are serious, and even cruel; others of a jocose and humorous kind. Even contrary things have been enacted as punishments for adultery. By some laws, the criminals are forbid marrying together, in case they became single; by others, they are forbid to marry any besides each other; by some, they are incapacitated from ever committing the like crime again; by others, they are glutted with it till it becomes downright nauseous.

Among the rich Greeks, adulterers were allowed to redeem themselves by a pecuniary fine; the woman's father, in such cases, returned the dower he had received from her husband, which some think was refunded by the adulterer. Another punishment among those people was, putting out the eyes of adulterers.

The Athenians had an extraordinary way of punishing adulterers, called παρατιλμος ῥαφανιδωσις, practised at least on the poorer sort who were not able to pay the fines. This was an awkward sort of impalement, performed by thursting one of the largest radishes up the anus of the adulterer, or, in defect thereof, a fish with a large head called *mugil*, "mullet." Alcæus is said to have died this way, though it is doubted whether the punishment was reputed mortal. Juvenal and Catullus speak of this custom, as received also among the Romans, though not authorised by an express law, as it was among the Greeks.

There are various conjectures concerning the ancient punishment of adultery among the Romans. Some will have it to have been made capital by a law of Romulus, and again by the twelve tables. Others, that it was first made capital by Augustus; and others, not before the emperor Constantine. The truth is, the punishment in the early days was very various, much being left to the discretion of the husband and parents of the adulterous wife, who exercised it differently, rather with the silence and countenance of the magistrate than any formal authority from him. Thus we are told, the wife's father was allowed to kill both parties, when caught in the fact, provided he did it immediately, killed both together, and as it were with one blow. The same power ordinarily was not indulged the husband, except the crime were committed with some mean or infamous person; tho', in other cases, if his rage carried him to put them to death, he was not punished as a murderer. On many occasions, however, revenge was not carried so far; but mutilating, castrating, cutting off the ears, noses, &c. served the turn. The punishment allotted by the *lex Julia*, was not, as many have imagined, death; but rather banishment, or deportation, being interdicted fire and water: though Octavius, appears, in several instances, to have gone beyond his own law, and to have put adulterers to death. Under Macrinus, many were burnt at a stake. Constantine first by law made the crime capital. Under Constantius and Constans, adulterers were burnt, or sewed in sacks and thrown into the sea. Under Leo and Marcian, the penalty was abated to perpetual banishment, or cutting off the nose. Under Justinian, a further mitigation was granted, at least in favour of the wife, who was only to be scourged, lose her dower, and be shut up in a monastery: after two years, the husband was at liberty to take her back again; if he refused, she was shaven, and made a nun for life: But it still remained death in the husband. The reason alleged for this difference is, that the woman is the weaker vessel. Matthæus declaims against the empress Theodora, who is supposed to have been the cause of this law, as well as of others procured in favour of that sex from the emperor.

Under Theodosius, women convicted of this crime were punished after a very singular manner, viz. by a public constupration; being locked up in a narrow cell, and forced to admit to their embraces all the men that would offer themselves. To this end the gallants were to dress themselves on purpose, having several little bells fastened to their clothes, the tinkling of which gave notice to those without of every motion. The custom was again abolished by the same prince.

By the Jewish law, adultery was punished by death in both parties, where they were both married, or only the woman. The Jews had a particular method of trying, or rather purging, an adulteress, or a woman suspected of the crime, by making her drink the bitter waters of jealousy; which, if she were guilty, made her swell.

Among the Mingrelians, according to Chardin, adultery is punished with the forfeiture of a hog, which is usually eaten in good friendship between the gallant, the adultress, and the cuckold. In some parts of the Indies, it is said any man's wife is permitted to prostitute herself to him who will give an elephant for the use of her; and it is reputed no small glory to her to

Adultery. have been rated so high. Adultery is said to be so frequent at Ceylon, that not a woman but practises it, notwithstanding its being punishable with death. Among the Japanese, and divers other nations, adultery is only penal in the woman. Among the Abyssinians, the crime of the husband is said to be only punished on the innocent wife. In the Marian islands, on the contrary, the woman is not punishable for adultery; but if the man go astray he pays severely: the wife and her relations waste his lands, turn him out of his house, &c. Among the Chinese, there is reason to conclude that adultery is not capital; for it is said that fond parents will make a contract for their daughters future husbands to allow them the indulgence of a gallant.

In Spain, they punished adultery in men by cutting off that part which had been the instrument of the crime. In Poland, before Christiany was established, they punished adultery and fornication in a very particular manner: the criminal they carried to the market-place, and there fastened him by the testicles with a nail; laying a razor within his reach, and leaving him under the necessity, either of doing justice upon himself or of perishing in that condition.

The Saxons formerly burnt the adultress, and over her ashes erected a gibbet, whereon the adulterer was hanged. In England, likewise, adultery, by the ancient laws, was severely punished. King Edmund the Saxon ordered adultery to be punished in the same manner as homicide; and Canute the Dane ordered that a man who committed adultery should be banished, and that the woman should have her nose and ears cut off. In the time of Henry I. it was punished with the loss of eyes and genitals.

In Britain, adultery is reckoned a spiritual offence, that is, cognizable by the spiritual courts, where it is punished by fine and penance. The common law takes no farther notice of it, than to allow the party grieved an action and damages. This practice is often censured by foreigners, as making too light of a crime, the bad consequences of which, public as well as private, are so great. It has been answered, that perhaps this penalty, by civil action, is more wisely calculated to prevent the frequency of the offence, which ought to be the end of all laws, than a severer punishment. He that by a judgment of law is, according to circumstances, stripped of great part of his fortune, thrown into prison till he can pay it, or forced to fly his country, will, no doubt, in most cases, own that he pays dearly for his amusement.

As to the moral turpitude of this offence, some have vainly endeavoured to deny or explain it away by various arguments, and even by an appeal to scripture. On the part of the *man* who solicits the chastity of a married woman, it certainly includes the crime of SEDUCTION, and is attended with mischief still more complicated and extensive: It creates a new sufferer, the injured husband, upon whose simplicity and affection is inflicted a wound the most painful and incurable that human nature knows. The infidelity of the *woman* is aggravated by cruelty to her children, who are generally involved in their parents shame, and always made unhappy by their quarrel.

It has been argued, that these consequences ought less to be attributed to the crime than to the discovery. But, in the first place, the crime could not be discovered unless it were committed, and the commission is never secure from discovery. 2*dly*, If adulterous connections were allowable whenever the parties could hope to escape detection, which is the conclusion to which this argument leads, the husband would be left no other security for his wife's chastity, than in her want of opportunity or temptation: which would probably deter most men from marrying; or render marriage a state of continual jealousy and alarm to the husband, which would end in the slavery and confinement of the wife.

The marriage-vow is "witnessed before God," and accompanied with circumstances of solemnity and religion which approach to the nature of an oath. The married offender, therefore, incurs a crime little short of perjury, and the seduction of a married woman is little less than subornation of perjury:—and this guilt is independent of the discovery.

But the usual apology for adultery is the prior transgression of the other party; and so far, indeed, as the bad effects of adultery are anticipated by the conduct of the husband or wife who offends first, the guilt of the second offender is extenuated. But this can never amount to a justification; unless it could be shown that the obligation of the marriage-vow depends upon the condition of reciprocal fidelity; a construction which appears founded neither in expediency, nor in the terms of the vow, nor in the design of the legislature which prescribed the marriage-rite. The way of considering the offence upon the footing of *provocation* and *retaliation*, is a childish trifling with words.

"Thou shalt not commit adultery," was an interdict delivered by God himself; yet scripture has been adduced as giving countenance to the crime. As Christ told the woman taken in adultery, "Neither do *I condemn* thee," we must believe, it is said, that he deemed her conduct either not criminal, or at least not a crime of the heinous nature we represent it to be. But from a more attentive examination of the case, it will be evident that nothing can be concluded from it favourable to such an opinion. The transaction is thus related*: 'Early in the morning Jesus came again into the temple, and all the people came unto him; and he sat down and taught them; and the Scribes and Pharisees brought unto him a woman taken in adultery; and when they had set her in the midst, they say unto him, Master, this woman was taken in adultery, in the very act; now Moses in the law commanded that such should be stoned, but what sayest thou? This they said tempting him, that they might have to accuse him: but Jesus stooped down, and with his finger wrote on the ground as though he heard them not. So when they continued asking him, he lift up himself, and said unto them, He that is without sin amongst you, let him first cast a stone at her; and again he stooped down and wrote on the ground: and they which heard it being convicted by their own conscience, went out one by one, beginning at the eldest, even unto the last; and Jesus was left alone, and the woman standing in the midst. When Jesus had lift up himself, and saw none but the woman, he said unto her, Woman, where are those thine accusers? Hath no man condemned thee? She said unto him, No man, Lord: and he said unto her, *Neither do I condemn thee;* go and sin no more.'

* St John's Gospel, ch. viii.

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Adultery.

'This they said tempting him, that they might 'have to accuse him;' that is, to draw him into an exercise of judicial authority, that they might have to accuse him before the Roman governor of usurping or intermeddling with the civil government.

Paley's *Moral and Political Philosophy*. Philad. ed. p. 203.

'This was their design; and Christ's behaviour throughout the whole affair proceeded from a knowledge of this design, and a determination to defeat it. He gives them at first a cold and sullen reception, well suited to the insiduous intention with which they came: 'he stooped down, and with his finger wrote on 'the ground as though he heard them not.' 'When 'they *continued* asking him,' when they teazed him to speak, he dismissed them with a rebuke, which the impertinent malice of their errand, as well as the secret character of many of them, deserved: 'he that is 'without sin (that is, this sin) among you, let him 'first cast a stone at her.' This had its effect. Stung with the reproof, and disappointed of their aim, they stole away one by one, and left Jesus and the woman alone. And then follows the conversation, which is the part of the narrative most material to our present subject. 'Jesus saith unto her, Woman, where are 'those thine accusers? hath no man condemned thee? 'She said, No man, Lord. And Jesus said unto her, Neither do I condemn thee; go and sin no more.' Now, when Christ asked the woman, 'Hath no man '*condemned* thee? he certainly spoke, and was understood by the woman to speak, of a legal and judicial condemnation; otherwise her answer, 'No man, Lord,' was not true. In every other sense of condemation, as blame, censure, reproof, private, judgment, and the like, many had condemned her; all those, indeed, who brought her to Jesus. If then a judicial sentence was what Christ meant by *condemning* in the question, the common use of language requires us to suppose that he meant the same in his reply, 'Neither do I con'demn thee:' *i. e.* I pretend to no judicial character or authority over thee; it is no office or business of mine to pronounce or execute the sentence of the law. When Christ adds, 'Go and sin no more,' he in effect tells her that she had sinned already; but as to the degree or quality of the sin, or Christ's opinion concerning it, nothing is declared, or can be inferred, either way."

It has been controverted, whether adultery may be lawfully committed in war, with the enemies wives? The answer is in the negative, and the authorised practice of civilized nations is agreeable to this. It has also been a famous question, whether it be lawful for a woman to commit adultery with the consent of her husband, and for the procuring some great good to him? St. Austin apparently allows of it; at least does not condemn it*.

*De Serm. Dom. in Mont. lib. i. cap. 16. § 49. et De Civ Dei, lib. xvi. cap. 25.

It has likewise been a dispute, whether it be lawful for one of the parties married to commit adultery, with the consent of the other, for the sake of having children? of which we have instances in Abraham, who, on this account, conversed with Hagar: and likewise among the Greeks and Romans. Pollman, a German professor, has a dissertation on the husband's right to alienate his wife's body to another's use.

It is much disputed whether adultery dissolves the bond of matrimony, and be a sufficient cause of divorce, so that the partiesmay marry again. This was allowed in the ancient church, and is still continued in the Greek, as well as the Lutheran and Calvinist churches. Romanists, however, disallow of it, and the council of Trent even anathematized those who maintain it: though the canon of anathematization was mitigated in deference to the republic of Venice, in some of whose dominions, as Zant, Cephalonia, &c. the contrary usage obtains. The ecclesiastical courts in England so far agree with those of Rome, that they only grant a divorce *à mensa et thoro*, in case of adultery; so that a complete divorce, to enable the parties to marry again, cannot be had without an act of parliament.

Adultery, Advocate.

ADULTERY is also used in ancient customs, for the punishment or fine imposed for that offence, or the privilege of prosecuting for it. In which sense *adulterium* amounts to the same with what the Saxons call *legerwita*.

ADULTERY is sometimes used in a more extensive sense, for any species of impurity or crime, against the virtue of chastity; and in this sense divines understand the seventh commandment.

ADULTERY is also used, especially in scripture, for idolatry, or departing from the true God, to the worship of a false one.

ADULTERY is also used, in ecclesiastical writers, for a person's invading or intruding into a bishopric during the former bishop's life. The reason of the appellation is, that a bishop is supposed to contract a kind of spiritual marriage with his church. The translation of a bishop from one see to another was also reputed a species of adultery on the supposition of its being a kind of second marriage, which, in those days, was esteemed a degree of adultery. This conclusion was founded on that text of St Paul, *Let a bishop be the husband of one wife*, by a forced construction of church for wife and of bishop for husband. Du-Cange.

ADULTERY is also used, in ancient naturalists, for the act of ingrafting one plant upon another. In which sense, Pliny speaks of the adulteries of trees, *arborum adulteria*, which he represents as contrary to nature, and a piece of luxury, or needless refinement.

ADVOCATE, among the Romans, a person skilled in their law, who undertook the defence of causes at the bar. The Roman advocates answered to one part of the office of a barrister in England, viz. the pleading part; for they never gave council, that being the business of the *jurisconsulti*.

The Romans, in the first ages of their state, held the profession of an advocote in great honour; and the seats of their bar were crowded with senators and consuls; they, whose voices commanded the people, thinking it an honour to be employed in defending them. They were styled *comites*, *honorati*, *clarissimi*, and even *patroni*; as if their clients were not less obliged to them than freed men to their masters. The bar was not at that time venal. Those who aspired to honours and offices took this way of gaining an interest in the people, and always pleaded *gratis*. But no sooner were luxury and corruption introduced into the commonwealth, than the bar become a sharer in them. Then it was that the senators let out their voices for pay, and zeal and eloquence were sold to the highest bidder. To put a stop to this abuse, the

Advocates. tribune Cincius procured a law to be passed, called from him *Lex Cincia*, whereby the advocates were forbid to take any money of their clients. It had before this been prohibited the advocates to take any presents or gratuities for their pleading. The emperor Augustus added a penalty to it: notwithstanding which, the advocates played their part so well, that the emperor Claudius thought it an extraordinary circumstance, when he obliged them not to take above eight great sesterces, which are equivalent to about 64l. Sterling, for pleading each cause.

ADVOCATE is still used, in countries and courts where the civil law obtains, for those who plead and defend the cause of clients trusted to them.

ADVOCATE of a City, in the German polity, a magistrate appointed in the emperor's name to administer justice.

ADVOCATE is more particularly used, in church history, for a person appointed to defend the rights and revenues of a church or religious house. The word *advocatus*, or *advowee*, is still retained for what we usually call the *patron*, or he who has the advowson, or right of presentation, in his own name.

Consistorial ADVOCATES; officers of the consistory at Rome, who plead in all oppositions to the disposal of benefices in that court: they are ten in number.

Elective ADVOCATES, those chosen by the abbot, bishop, or chapter; a particular licence being had from the king, or prince, for that purpose. The elections were originally made in the presence of the count of the province.

Feudal ADVOCATES. These were of the military kind, who, to make them more zealous for the interest of the church, had lands granted them in fee, which they held of the church, and did homage, and took an oath of fidelity to the bishop or abbot. These were to lead the vassals of the church to war, not only in private quarrels of the church itself, but in military expeditions for the king's service, in which they were the standard-bearers of their churches.

Fiscal ADVOCATE, *fisci advocatus*, in Roman antiquity, an officer of state under the Roman emperors, who pleaded in all causes wherein the *fiscus*, or private treasury, was concerned.

Juridical ADVOCATES, in the middle age, were those who from attending causes in the court of the comes, or count of the province, became judges themselves, and held courts of their vassals thrice a-year, under the name of the *tria placita generalia*. In consideration of this further service, they had a particular allowance of one third part of all fines, or mulcts, imposed on defaulters, &c. besides a proportion of diet for themselves and servants.

Matricular ADVOCATES, were the advocates of the mother or cathedral churches.

Military ADVOCATES, those appointed for the defence of the church, rather by arms and authority than by pleading and eloquence. These were introduced in the times of confusion, when every person was obliged to maintain their own property by force; bishops and abbots not being permitted to bear arms, and the scholastic or gowned advocates being equally unacquainted with them, recourse was had to knights, noblemen, soldiers, or even to princes.

Nominative ADVOCATES, those appointed by a king or pope. Sometimes the churches petitioned kings, &c. to appoint them an advocate; at other times this was done of their own accord. By some regulations, no person was capable of being elected advocate, unless he had an estate in land in the same county. Advocates.

Regular ADVOCATES, those duly formed and qualified for their profession, by a proper course of study, the requisite oath, subscription, licence, &c.

Subordinate ADVOCATES, those appointed by other superior ones, acting under them, and accountable to them. There were various reasons for the creation of these subordinate advocates; as, the superior quality of the principal advocate, his being detained in war, or being involved in other affairs; but chiefly the too great distance of some of the church-lands, and their lying in the dominions of foreign princes.

Supreme or *Sovereign ADVOCATES*, were those who had the authority in chief; but acted by deputies or subordinate advocates. These were called also *principal*, *greater*, and sometimes *general* advocates. Such in many cases were kings, &c. when either they had been chosen advocates, or became such by being founders or endowers of churches. Princes had also another title to advocateship; some of them pretending to be *advocati nati* of the churches within their dominions.

ADVOCATES, in the English courts, are more generally called *counsel*. See COUNSEL.

Faculty of ADVOCATES, in Scotland, a respectable body of lawyers, who plead in all causes before the Court of Session, Justiciary, and Exchequer. They are also intitled to plead in the house of peers, and other supreme courts in England.

In the year 1660, the faculty founded a library upon a very extensive plan, suggested by that learned and eminent lawyer Sir George M'Kenzie of Rosehaugh, advocate to king Charles II. and king James VII. who enriched it with many valuable books. It has been daily increasing since that time, and now contains not only the best collection of law-books in Europe, but a very large and select collection of books on all subjects. Besides, this library contains a great number of original manuscripts, and a vast variety of Jewish, Grecian, Roman, Scots, and English coins and medals.

A candidate for the office of an advocate undergoes three several trials: The first is in Latin, upon the civil law and Greek and Roman antiquities; the second, in English, upon the municipal law of Scotland; and, in the third, he is obliged to defend a Latin thesis, which is impugned by three members of the faculty. Immediately before putting on the gown, the candidate makes a short Latin speech to the lords, and then takes the oaths to the government and *de fideli*.

The faculty at present consists of above 200 members. As an advocate or lawyer is esteemed the genteelest profession in Scotland, many gentlemen of fortune take the degree of advocate, without having any intention of practising at the bar. The circumstance greatly increases their number, gives dignity to the profession, and enriches their library and public fund. It is from this respectable body that all vacancies on the bench are generally supplied.

Lord ADVOCATE, or *King's Advocate*, one of the eight great officers of state in Scotland, who as such

Advocation Advowee.

sat in parliament without election. He is the principal crown-lawyer in Scotland. His business is to act as a public prosecutor, and to plead in all cases that concern the crown; but particularly in such as are of a criminal nature. The office of king's advocate is not very ancient: It seems to have been established about the beginning of the 16th century. Originally he had no power to prosecute crimes without the concurrence of a private party; but, in the year 1597, he was empowered to prosecute crimes at his own instance. He has the privilege of pleading in court with his hat on. This privilege was first granted to Sir Thomas Hope; who having three sons lords of session, it was thought indecent that the father should plead uncovered before the sons, who as judges sat covered.

Bill of ADVOCATION, in Scots law, a writing drawn up in the form of a petition; whereby a party, in an action before an inferior court, applies to the supreme court, or court of Session, for calling the action from the inferior court before itself.

Letters of Advocation, in Scots law, the decree or warrant of the court of Session upon cognisance of the facts set forth in the bill, drawn up in the form of a summons, and passing under the signet, discharging the inferior judge and all others from further procedure in the cause, and advocating it to itself.

ADVOWEE, in ancient customs and law books, denotes the advocate of a church, religious house, or the like. There were advowees of cathedrals, abbeys, monasteries, &c. Thus, Charlemagne had the title of advowee of St Peter's; king Hugh, of St Riquier; and Bolandus mentions some letters of pope Nicholas, by which he constituted king Edward the Confessor, and his successors, advowees of the monastery at Westminster, and of all the churches in England. These advowees were the guardians, protectors, and administrators of the temporal concerns of the churches, &c. and under their authority were passed all contracts which related to them. It appears also, from the most ancient charters, that the donations made to churches were conferred on the persons of the advowees. They always pleaded the causes of the churches in court, and distributed justice for them, in the places under their jurisdiction. They also commanded the forces furnished by their monasteries, &c. for the war; and even were their champions, and sometimes maintained duels for them.

This office is said to have been first introduced in the fourth century, in the time of Stillico; though the Benedictines do not fix its origin before the eighth century. By degrees, men of the first rank were brought into it, as it was found necessary either to defend with arms or to protect with power and authority. In some monasteries they were only called *conservators*; but these, without the name, had all the functions of advowees. There were also sometimes several sub-advowees, or sub-advocates, in each monastery, who officiated instead of the advowees themselves; which, however, proved the ruin of monasteries; those inferior officers running into great abuses.

Hence also, husbands, tutors, and every person in general, who took upon him the defence of another, were denominated *advowees*, or advocates. Hence several cities had their advowees; which were established long after the ecclesiastical ones, and doubtless from their example. Thus we read in history of the advowees of Augsburg, of Arras, &c.

Advowee, Advowson.

The *vidames* assumed the quality of advowees; and hence it is, that several historians of the eighth century confound the two functions together. Hence also it is, that several secular lords in Germany bear mitres for their crests, as having anciently been advowees of the great churches.

Spelman distinguishes two kinds of ecclesiastical advowees.—The one, of causes or processes *advocati causarum*; the other, of territory or lands, *advocati soli*. The former were nominated by the king, and were usually lawyers, who undertook to plead the causes of the monasteries. The other, which still subsist, and are sometimes called by their primitive name, *advowees*, though more usually *patrons*, were hereditary; as being the founders and endowers of churches, &c. or their heirs.

Women were sometimes advowees, *advocatissæ*. And, in effect, the canon law mentions some who had this title, and who had the same right of presentation, &c. in their churches which the advowees themselves had. In a stat. 25 Edw. III. we meet with *advowee paramount* for the highest patron; that is, the king.

ADVOWSON, or Advowzen, in common law, signifies a right to present to a vacant benefice. Advowson is so called, because the right of presenting to the church was first gained by such as were founders, benefactors, or maintainers of the church.

Though the nomination of fit persons to officiate in every diocese was originally in the bishop, yet they were content to let the founders of churches have the nomination of the persons to the churches so founded, reserving to themselves a right to judge of the fitness of the persons so nominated.

Advowsons formerly were most of them appendant to manors, and the patrons were parochial barons: the lordship of the manor and patronage of the church were seldom in different hands, until advowsons were given to religious houses. But of late times the lordship of the manor and advowson of the church have been divided.

Advowsons are *presentative*, *collative*, or *donative*: *presentative*, where the patron presents or offers his clerk to the bishop of the diocese, to be instituted in his church; *collative*, where the benefice is given by the bishop, as original patron thereof, or by means of a right he has acquired by lapse; *donative*, as where the king or other patron does, by a single donation in writing, put the clerk into possession, without presentation, institution, or induction.

Sometimes, anciently, the patron had the sole nomination of the prelate, abbot, or prior; either by investiture (*i. e.* delivery of a pastoral staff), or by direct presentation to the diocesan; and if a free election was left to the religious, yet a *congé d'elire*, or licence of election, was first to be obtained of the patron, and the person elected was confirmed by him. If the founder's family became extinct, the patronage of the convent went to the lord of the manor. Unless the several colleges in the universities be restrained in the number of advowsons they may receive, it is argued they will in time acquire such a stock as to frustrate the design of their foundation (which is the education of youth, by creating too quick a succession of fellows;

lows; so that there will not be in the colleges a sufficient number of persons of competent age, knowledge, and experience, to instruct and form the minds of the youth.—In some colleges the number of advowsons is said to be already two thirds, or more, of the number of fellows.—It is objected, on the other side, that the succession of fellows may be too slow as well as too quick; whereby persons well qualified may be detained so long in colleges as not to have strength or activity enough left for the discharge of parochial functions.

Colleges holding more advowsons in number than moiety of the fellows, are not capable of purchasing more. Grants of advowsons by papists are void. 9 Geo. II. c. 36. § 5. 11 Geo. II. c. 17. § 5.

Advowsons are temporal inheritances and lay fees; they may be granted by deed or will, and are assets in the hands of heirs or executors. Presentations to advowsons for money, or other reward, are void. 31 Eliz. cap. 6.

In Scotland, this right is called *patronage*. See PATRONAGE.

ADUST, ADUSTUS, among physicians, &c. is applied to such humours as by long heat become of a hot and fiery nature. Such is choler supposed to be. Melancholy is usually considered as black and adust bile. Blood is said to be adust, when, by reason of some extraordinary heat, its more subtile parts are all evaporated, leaving the grosser, with all the impurities therein, half torrified.

ADY, in natural history, a name given to the palm-tree of the island of St Thomas. It is a tall tree, with a thick, bare, upright stem, growing single on its root, of a thin light timber, and full of juice. The head of this tree shoots into a vast number of branches, which being cut off, or an incision being made therein, afford a great quantity of sweet juice, which fermenting supplies the place of wine among the Indians. The fruit of this tree is called by the Portuguese *Caryoces* and *Cariosse*; and by the black natives, *Abanga*. This fruit is of the size and shape of a lemon; and contains a kernel, which is good to eat. The fruit itself is eat roasted, and the raw kernels are often mixed with mandioc meal. These kernels are supposed very cordial. An oil is also prepared from this fruit, which answers the purpose of oil or butter. This oil is also used for anointing stiff and contracted parts of the body.

ADYNAMIA, in medicine, debility, or weakness, from sickness.

ADYNAMON, among ancient physicians, a kind of weak factitious wine, prepared from must boiled down with water; to be given to patients to whom genuine wine might be hurtful.

ADYTUM, in pagan antiquity, the most retired and sacred place of their temples, into which none but the priests were allowed to enter. The *Sanctum Sanctorum* of the temple of Solomon was of the nature of the pagan adytum, none but the high priest being admitted into it, and he but once-year.

ADZE, or ADDICE, a cutting-tool of the ax kind; having its blade made thin and arching, and its edge at right angles to the handle; chiefly used for taking off thin chips of timber or boards, and for paring away certain irregularities which the ax cannot come at. The adze is used by carpenters, but more by coopers, as being convenient for cutting the hollow sides of boards, &c. It is ground from a base on its inside to its outer edge; so that, when it is blunt, they cannot conveniently grind it without taking its helve out of the eye.

AE, or Æ, a diphthong compounded of A and E. Authors are by no means agreed as to the use of the *ae* in English words.—Some, out of regard to etymology, insist on its being retained in all words, particularly technical ones, borrowed from the Greek and Latin; while others, from a consideration that it is no proper diphthong in our language, its sound being no other than that of the simple *e*, contend that it ought to be entirely disused; and, in fact, the simple *e* has of late been adopted instead of the Roman *æ*, as in the word *equator*, &c.

ÆACEA, in Grecian antiquity, solemn festivals and games celebrated at Ægina, in honour of Æacus.

ÆACUS, the son of Jupiter by Ægina. When the isle of Ægina was depopulated by a plague, his father, in compassion to his grief, changed all the ants upon it into men and women, who were called *Myrmidons*, from μυρμηξ, *an ant*. The foundation of the fable is said to be, that when the country had been depopulated by pirates, who forced the few that remained to take shelter in caves, Æacus encouraged them to come out, and by commerce and industry recover what they had lost. His character for justice was such, that, in a time of universal drought, he was nominated by the Delphic oracle to intercede for Greece, and his prayer was answered. See the article ÆGINA. The Pagans also imagined that Æacus, on account of his impartial justice, was chosen by Pluto one of the three judges of the dead: and that it was his province to judge the Europeans.

ÆBURA (anc. geog.), a town of Spain, in Estremadura, on the river Guadiana, to the west of Merida, now called *Talavera*. W. Long. 7. 15. Lat. 38. 40.

ÆCHMALOTARCHA, in Jewish antiquity, a title given to the principal leader or governor of the Hebrew captives residing in Chaldea, Assyria, and the neighbouring countries. This magistrate was called by the Jews *rosch-galah*, *i. e.* the chief of the captivity: but the above term, of like import in the Greek, is that used by Origen and others who wrote in the Greek tongue.

The Jewish writers assure us, that the *æchmalotarchæ* were only to be chosen out of the tribe of Judah. The eastern Jews had their princes of the captivity, as the western Jews their patriarchs. The Jews are still said to have an *æchmalotarcha* at Babylon, but without the authority of the ancient ones. Basnage Hist. Jews, and Prideaux's Connection.

ÆCULANUM (anc. geog.), a town of the Hirpini in Italy, at the foot of the Appenine, to the east of Abellinum, contracted *Æclanum*, situate between Beneventum and Tarentum. The inhabitants are called *Æculani* by Pliny; and *Æclanenses*, in an ancient inscription, (Gruter). The town is now called *Fricento*, Cluverius 43 miles east of Naples. E. Long. 15. 38. Lat. 41. 15.

ÆDES, in Roman antiquity, besides its more ordinary signification of a house, likewise signified an inferior kind of temple, consecrated to some deity.

ÆDICULA, a term used to denote the inner part of of the temple, where the altar and statue of the deity stood.

ÆDILATE, the office of ædile, sometimes called *Ædilitiy*. See the next article.

ÆDILE (*ædilis*), in Roman antiquity, a magistrate whose chief business was to superintend buildings of all kinds, but more especially public ones, as temples, aqæducts, bridges, &c. To the ædiles likewise belonged the care of the highways, public places, weights and measures, &c. They also fixed the prices of provisions, took cognizance of debauches, punished lewd women, and such persons as frequented gaming houses. The custody of the plebiscita, or orders of the people, was likewise committed to them. They had the inspection of comedies and other pieces of wit; and were obliged to exhibit magnificent games to the people, at their own expence, whereby many of them were ruined. To them also belonged the custody of the plebiscita, and the censure and examination of books. They had the power, on certain occasions, of issuing edicts; and, by degrees, they procured to themselves a considerable jurisdiction, the cognizance of various causes, &c. This office ruined numbers by its expensiveness; so that, in Augustus's time, even many senators declined it on that account.

All these functions which rendered the ædiles so considerable belonged at first to the ædiles of the people, *ædiles plebeii*, or *minores*: these were only two in number, and were first created in the same year as the tribunes: for the tribunes, finding themselves oppressed with the multiplicity of affairs, demanded of the senate to have officers, with whom they might intrust matters of less importance; and accordingly two ædiles were created; and hence it was that the ædiles were elected every year at the same assembly as the tribunes. But these plebeian ædiles having refused, on a signal occasion, to treat the people with shows, as pleading themselves unable to support the expence thereof, the patricians made an offer to do it, provided they would admit them to the honours of the *ædilate*. On this occasion there were two ædiles created, of the number of the patricians, in the year of Rome 388; they were called *ædiles curules*, or *majores*; as having a right to sit on a curule chair, enriched with ivory, when they gave audience; whereas the plebeian ædiles only sat on benches.—Besides that the curule ædiles shared all the ordinary functions with the plebeian, their chief employ was, to procure the celebration of the grand Roman games, and to exhibit comedies, shews of gladiators, &c. to the people; and they were also appointed judges in all cases relating to the selling or exchanging estates.

To ease these four first ædiles, Cæsar created a new kind, called *ædiles cereales*, as being deputed chiefly to take care of the corn, which was called *donum cereris*; for the Heathens honoured Ceres as the goddess who presided over corn, and attributed to her the invention of agriculture. These ædiles cereales were also taken out of the order of patricians. In the municipal cities there were ædiles, and with the same authority as at Rome.

We also read of an *ædiles alimentarius*, expressed in abbreviature by *Ædil. alim.* whose business seems to have been to provide diet for those who were maintained at the public charge, though others assign him a different office.—In an ancient inscription we also meet with *ædile* of the camp, *ædilis castrorum*.

ÆDILITIUM EDICTUM, among the Romans, was that whereby a remedy was given a buyer, in case a vicious or unsound beast, or slave, was sold him. It was called *ædilitium*, because the preventing of frauds in sales and contracts belonged especially to the curule ædiles.

ÆDITUUS, in Roman antiquity, an officer belonging to the temple, who had the charge of the offerings, treasure, and sacred utensils. The female deities had a woman officer of this kind called *Æditua*.

ÆGAGROPILA, a ball composed of a substance resembling hair, generated in the stomach, of the chamois-goat. This ball is of the same nature with those found in cows, hogs, &c.

ÆGÆ, or ÆGÆA (anc. geog.), the name of *Ædessa*, so called from the following adventure: Caranus, the first king of Macedonia, being ordered by the oracle to seek out a settlement in Macedonia, under the conduct of a flock of goats, surprised the town of Ædessa during a thick fog and rainy weather, in following the goats that fled from the rain; which goats ever after, in all his military expeditions, he caused to precede his standard; and in memory of this he called Ædessa *Ægæa*, and his people *Ægæadæa*. And hence probably, in the prophet Daniel, the he-goat is the symbol of the king of Macedon.

ÆGEAN SEA (anc. geog.), now the *Archipelago*, a part of the Mediterranean, separating Europe from Asia and Africa; washing, on the one hand, Greece and Macedonia; on the other, Caria and Ionia. The origin of the name is greatly disputed. Festus advances three opinions: one, that it is so called from the many islands therein, at a distance appearing like so many goats: another, because Ægea queen of the Amazons perished in it: a third opinion is, because Ægeus, the father of Theseus, threw himself headlong into it.

ÆGEUS, in fabulous history, was king of Athens, and the father of Theseus. The Athenians having basely killed the son of Minos king of Crete, for carrying away the prize from them, Minos made war upon the Athenians; and being victorious, imposed this severe condition on Ægeus, that he should annually send into Crete seven of the noblest of the Athenian youths, chosen by lot, to be devoured by the Minotaur. On the fourth year of this tribute, the choice fell on Theseus; or, as others say, he himself intreated to be sent. The king, at his son's departure, gave orders, that as the ship sailed with black sails, it should return with the same in case he perished; but, if he became victorious, he should change them into white. When Theseus returned to Crete, after killing the Minotaur, and forgot to change the sails in token of his victory, according to the agreement with his father; the latter, who watched the return of the vessel, supposing by the black sails that his son was dead, cast himself headlong into the sea, which afterwards obtained the name of the *Ægean Sea*. The Athenians decreed Ægeus divine honours; and sacrificed to him as a marine deity, the adopted son of Neptune.

ÆGIAS, among physicians, a white speck on the pupil of the eye, which occasions a dimness of sight.

ÆGIDA, (Pliny); now *Capo d' Istria*, the principal

Ægilops | Ægina.

pal town on the north of the territory of Istria, situated in a little island, joined to the land by a bridge. In an inscription, (Gruter), it is called *Ægidis Insula*. E. Long. 14. 20. Lat. 45. 50. It was afterwards called *Justinopolis*, after the emperor Justinus.

ÆGILOPS, the name of a tumor in the great angle of the eye; either with, or without, an inflammation. The word is compounded of αιξ, *goat*, and ωψ, *eye*; as goats are supposed extremely liable to this distemper.

Authors frequenly use the words *ægilops*, *anchilops*, and *fistula lachrymalis*, promiscuously; but the more accurate, after Ægineta, make a difference.—The tumor, before it becomes ulcerous, is properly called *anchilops*: and, after it is got into the lachrymal passages, and has rendered the os lachrymale carious, *fistula lachrymalis*.

If the ægilops be accompanied with an inflammation, it is supposed to take its rise from the abundance of blood which a plethoric habit discharges on the corner of the eye. If it be without an inflammation, it is supposed to proceed from a viscous pituitous humour, thrown upon this part.

The method of cure is the same as that of the ophthalmia. But before it has reached the lachrymal passages, it is managed like other ulcers. If the ægilops be neglected, it bursts, and degenerates into a fistula, which eats into the bone.

ÆGILOPS, *Wild Festuc*; a genus of the monœcia order, belonging to the polygamia class of plants, and ranking under the 4th natural order, *Gramina*.—The characters are: The *hermaphrodite calyx* is a two-valved glume, triflorous; the corolla a two-valved glume, the exterior valvalet terminated by three aristæ or awns, the interior awnless: *Stamina*, three capillary filaments; style, two: *Seed*, one, oblong. *Male calyx* and *corolla*, each a glume as in the former; and *stamina*, the same number.—There are seven species, natives of Italy and some other parts of Europe; one of them, the incurvata, a native of Britian, grows by the sea-shore, and is vulgarly called *sea-hard-grass*.

ÆGILOPS is also the trivial name of a species of QUERCUS.

ÆGIMURUS (anc. geog.), an island on the bay of Carthage, about 30 miles distant from that city, (Livy); now the *Galetta*: This island being afterwards sunk in the sea, two of its rocks remained above water, which were called *Aræ*, and mentioned by Virgil, because the Romans and Carthaginians entered into an agreement or league to settle their mutual boundries at these rocks.

ÆGINA, in fabulous history, the daughter of Æsopus, king of Bæotia, was beloved by Jupiter, who debauched her in the similitude of a lambent flame, and then carried her from Epidaurus to a desert island called *Oenope*, which afterwards obtained her own name.

ÆGINA (anc. geog.), an island on the Saronic Bay, or bay of Engia, 20 miles distant from the Piræeus, formerly vying with Athens for naval power, and at the sea-fight of Salamin disputing the palm of victory with the Athenians. It was the country and kingdom of Æacus, who called it *Ægina* from his mother's name, it being before called *Oenopia*, (Ovid). The inhabitants were called *Æginetæ*, and *Æginenses*. The Greeks had a common temple dedicated to Jupiter in Ægina. The Æginetæ applied to commerce: and were the first who coined money, called Νομισμα Αγιναιον: hence *Æginetic um æs*, formerly in great repute. The inhabitants were called *Myrmydones*, or a nation of ants, from their great application to agriculture. See ÆACUS.

This island was surrounded by Attica, the territory of Megara, and the Peloponnesus, each distant about 100 stadia, or 12 miles and a half. In circumference it was reckoned 180 stadia, or 22 miles and a half. It was washed on the east and south by the Myrtoan and Cretan seas.

It is now called *Eyina*, or *Egina*, the *g* soft and the *i* short. The temple abovementioned is situated upon the summit of a mountain called *Panhellenius*, about an hour distant from the shore. The Æginetans affirmed it was erected by ÆACUS; in whose time Hellas being terribly oppressed by drought, the Delphic oracle was consulted; and the response was, That Jupiter must be rendered propitious by Æacus. The cities intreated him to be their mediator: He sacrificed and prayed to Jupiter Panhellenius, and procured rain.

The temple was of the Doric order, and had six columns in front. Twenty-one of the exterior columns are yet standing, with two in the front of the pronaos and of the posticum, and five of the number which formed the ranges of the cell. The entablature, except the architrave, is fallen. The stone is of a light brownish colour, much eaten in many places, and indicating a very great age. Some of the columns have been injured by boring to their centres for the metal. In several, the junction of the parts is so exact, that each seems to consist of one piece. This ruin Mr Chandler considers as scarcely to be paralleled in its claim to a remote antiquity. The situation on a lonely mountain, at a distance from the sea, has preserved it from total demolition, amid all the changes and accidents of numerous centuries.

Near the shore is a barrow, raised, it is related, for Phocus, upon the following occasion. Telamon and Peleus, sons of Æacus, challenged their half-brother Phocus to contend in the Pentathlum. In throwing the stone, which served as a quoit, Peleus hit Phocus, who was killed; when both of them fled. Afterwards, Telamon sent a herald to assert his innocence. Æacus would not suffer him to land, or to apologize, except from the vessel; or, if he chose rather, from a heap cast up in the water. Telamon, entering the private port by night, raised a barrow, as a token, it is likely, of a pious regard for the deceased. He was afterwards condemned, as not free from guilt; and sailed away again to Salamis. The barrow in the second century, when seen by Pausanias, was surrounded with a fence, and had on it a rough stone. The terror of some dreadful judgment to be inflicted from heaven had preserved it entire and unaltered to his time; and in a country depopulated and neglected, it may still endure for many ages.

The soil of this island is, as described by Strabo, very stony, especially the bottoms, but in some places not unfertile in grain. Besides corn, it produces olives, grapes, and almonds; and abounds in pigeons and partridges. It has been related, that the Æginetans annually wage war with the feathered race, carefully

fully collecting or breaking their eggs, to prevent their multiplying, and in consequence a yearly famine. They have no hares, foxes, or wolves. The rivers in summer are all dry. The vaiwode or governor farms the revenue of the Grand Signior for 12 purses, or 6000 piastres. About half this sum is repaid yearly by the caratch-money, or poll-tax.

ÆGINA, the capital of the above island. Its site has been long forsaken. Instead of the temples mentioned by Pausanias, there are 13 lonely churches, all very mean; and two Doric columns supporting their architrave. These stand by the sea-side toward the low cape; and, it has been supposed, are a remnant of a temple of Venus, which was situated by the port principally frequented. The theatre, which is recorded as worth seeing, resembled that of the Epidaurians both in size and workmanship. It was not far from the private port; the stadium, which, like that at Priene, was constructed with only one side, being joined to it behind, and each structure mutually sustaining and propping the other. The walls belonging to the ports and arsenal were of excellent masonry, and may be traced to a considerable extent, above, or nearly even with the water. At the entrance of the mole, on the left, is a small chapel of St Nicholas; and opposite, a square tower with steps before it, detached, from which a bridge was laid across, to be removed on any alarm. This structure, which is mean, was erected by the Venetians, while at war with the Turks in 1693.

ÆGINETA (Paulus), a celebrated surgeon of the island of Ægina, from whence he derived his name. According to M. Le Clerc's calculation, he lived in the fourth century; but Abulpharagius the Arabian, who is allowed to give the best account of those times, places him with more probability in the seventh. His knowledge in surgery was very great, and his works are deservedly famous. Fabricius ab Aquapendente has thought fit to transcribe him in a great variety of places. Indeed the doctrine of Paulus Ægineta, together with that of Celsus and Albucasis, make up the whole text of this author. He is the first writer who takes notice of the cathartic quality of rhubarb; and, according to Dr Milward, is the first in all antiquity who deserves the title of a man-midwife.

ÆGINHARD, the celebrated secretary and supposed son-in-law of Charlemagne. He is said to have been carried through the snow on the shoulders of the affectionate and ingenious Imma, to prevent his being tracked from her apartments by the emperor her father: a story which the elegant pen of Addison has copied and embellished from an old German chronicle, and inserted in the 3d volume of the Spectator.—This happy lover (supposing the story to be true) seems to have possessed a heart not unworthy of so enchanting a mistress, and to have returned her affection with the most faithful attachment; for there is a letter of Æginhard's still extant, lamenting the death of his wife, which is written in the tenderest strain of connubial affliction;—it does not, however, express that this lady was the affectionate princess, and indeed some late critics have proved that Imma was not the daughter of Charlemagne.—But to return to our historian: He was a native of Germany, and educated by the munificence of his imperial master, of which he has left the most grateful testimony in his preface to the life of that monarch.

Æginhard, after the loss of his lamented wife, is supposed to have passed the remainder of his days in religious retirement, and to have died soon after the year 840. His life of Charlemagne, his annals from 741 to 839, and his letters, are all inserted in the 2d volume of Duchesne's Scriptores Francorum. But there is an improved edition of this valuable historian, with the annotations of Hermann Schmincke, in 4to, 1711.

ÆGIPAN, in heathen mythology, a denomination given to the god Pan, because he was represented with the horns, legs, feet, &c. of a goat.

ÆGIPHILA, GOAT-FRIEND; a genus of the monogynia order, belonging to the tetrandria class of plants; the characters of which are: The *calyx* is a single-leaved perianthium, bell-shap'd, four-tooth'd, loose, very short, and persistent: The *corolla* consists of one petal; the tubus cylindric, narrower and longer than the calyx; the border divided into four segments, flat and equal; the divisions oblong: The *stamina* consist of four erect capillary filaments; the antheræ are incumbent and squared: The *pistillum* has a germen above; a capillary, two-cleft, middle-sized stylus; and a simple stigma: The *pericarpium* is a roundish unilocular berry: The *seeds* are four. There is only one species, a native of Martinique.

ÆGIS, in the ancient mythology, a name given to the shield or buckler of Jupiter and Pallas.

The goat Amalthea, which had suckled Jove, being dead, that god is said to have covered his buckler with the skin thereof; whence the appellation *ægis*, from αιξ, αιγος, *she-goat*. Jupiter, afterwards restoring the beast to life again, covered it with a new skin, and placed it among the stars. As to his buckler, he made a present of it to Minerva; whence that goddess's buckler is also called *ægis*.

Minerva, having killed the Gorgon Medusa, nailed her head in the middle of the ægis, which henceforth had the faculty of converting into stone all those who looked thereon; as Medusa herself had done during her life.

Others take the ægis not to have been a buckler, but a cuirass, or breast-plate: and it is certain the ægis of Pallas, described by Virgil, Æn. lib. viii. ver. 435, must have been a cuirass; since that poet says expressly, that Medusa's head was on the breast of the goddess. But the ægis of Jupiter, mentioned a little higher, ver. 354, seems to have been a buckler: the words

Cum sæpe nigrantem
Ægida *concuteret dextra*,

agreeing very well to a buckler; but not at all to a cuirass or breast-plate.

Servius makes the same distinction on the two passages of Virgil: for on verse 354, he takes the ægis for the buckler of Jupiter, made, as abovementioned, of the skin of the goat Amalthea; and on verse 455 he describes the ægis as the armour which covers the breast, which in speaking of men is called *cuirass*, and *ægis* in speaking of the gods. Many authors have overlooked these distinctions for want of going to the sources.

ÆGISTHUS, in ancient history, was the son of Tyestes by his own daughter Pilopeia, who, to conceal her shame, exposed him in the woods: some say he was taken up by a shepherd, and suckled by a goat, whence he was called *Ægisthus*. He corrupted Clytemneſtra the wife of Agamemnon; and with her aſſiſtance ſlew her huſband, and reigned ſeven years in Mycenæ. He was, together with Clytemneſtra, ſlain by Oreſtes. Pompey uſed to call Julius Cæſar *Ægiſthus*, on account of his having corrupted his wife Mutia, whom he afterwards put away, though he had three children by her.

ÆGITHALLUS (anc. geog.), a promontory and citadel of Sicily, between Drepanum and the Emporium Aegiſtanum, afterwards called *Acellus*; corruptly written *Aegitharſos*, in Ptolemy; ſituate near mount Eryx, and now called *Capo di Santo Teodoro*.

ÆGIUM, (anc. geog.) a town of Achaia Propria, five miles from the place where Helice ſtood, and famous for the council of the Acheans, which uſually met there on account either of the dignity or commodious ſituation of the place. It was alſo famous for the worſhip of Ομαγυριος Ζευς, *Conventional Jupiter*, and of *Panathæan Ceres*. The territory of Ægium was watered by two rivers, viz. the Phœnix and Meganitas. The epithet is *Ægienſis*. There is a coin in the cabinet of the king of Pruſſia, with the inſcription AIΓI, and the figure of a tortoiſe, which is the ſymbol of Peloponneſus, and leaves no doubt as to the place where it was ſtruck.

ÆGOBOLIUM, in antiquity, the ſacrifice of a goat offered to Cybele. The ægobolium was an expiatory ſacrifice, which bore a near reſemblance to the taurobolium and criobolium, and ſeems to have been ſometimes joined with them.

ÆGOPODIUM, SMALL WILD ANGELICA, GOUTWORT, GOATSFOOT, HERB GERARD, or ASHWEED; a genus of the digynia order, belonging to the pentandria claſs of plants; the characters of which are: The univerſal *calyx* is a manifold convex umbel; the partial one, conſimilar and flat; there is no involucrum; and the proper perianthium is ſcarcely diſcernible: The univerſal *corolla* is uniform, the florets all fertile; the proper one has five inverſe-ovate, concave, equal petals, inflected at the top: The *ſtamina* conſiſt of five ſimple filaments twice the length of the corolla; the antheræ roundiſh: The *piſtillum* has a germen beneath; two purple erect ſtyli the length of the corollet; the ſtamina are headed: No *pericarpium*: The fruit is ovate, ſtriated, and bipartite: The *ſeeds* are two, ovate, on one ſide convex and ſtriated, and flat on the other. There is but one ſpecies, a native of Britain and other parts of Europe. It is very common under hedges and about gardens; the leaves reſemble thoſe of Angelica, and it carries ſmall white flowers. Its roots run ſo faſt, as to render it a very troubleſome weed.

ÆGOPRICORN, a genus of the monœcia order, belonging to the diandria claſs of plants; the characters of which are: The *calyx* both of the male and female is a tubular perianthium of one leaf divided into three ſegments: *Corolla* wanting in both: The *ſtamina* conſiſt of a ſingle erect filament longer than the calyx, with an ovate anthera: The *piſtillum* has an ovate germen, three divaricated ſtyli, and ſimple perſiſtent ſtigmata: The *pericarpium* is a globular berry, three-grained within, and three-cell'd: The *ſeeds* are ſolitary, and angular on one ſide.—There is but one ſpecies, a native of Surinam.

ÆGOSPOTAMOS, (anc. geog.), a river in the Thracian Cherſoneſus, falling with a ſouth-eaſt courſe into the Helleſpont, to the north of Ceſtos; alſo a town, ſtation, or road for ſhips, at its mouth. Here the Athenians, under Conon, through the fault of his colleague Iſocrates, received a ſignal overthrow from the Lacedemonians under Lyſander, which was followed by the taking of Athens, and put an end to the Peloponneſian war. The Athenian fleet having followed the Lacedemonians, anchored in the road, over againſt the enemy, who lay before Lampſacus. The Helleſpont is not above two thouſand paces broad in that place. The two armies ſeeing themſelves ſo near each other, expected only to reſt that day, and were in hopes of coming to a battle on the next.

But Lyſander had another deſign in his view. He commanded the ſeamen and pilots to go on board their galleys, as if they were in reality to fight the next morning at break of day, to hold themſelves in readineſs, and to wait his orders with profound ſilence. He commanded the land-army in like manner to draw up in battle upon the coaſt, and to wait the day without noiſe. On the morrow, as ſoon as the ſun was riſen, the Athenians began to row towards them with their whole fleet in one line, and to bid them defiance. Lyſander, though his ſhips were ranged in order of battle, with their heads towards the enemy, lay ſtill without making any movement. In the evening, when the Athenians withdrew, he did not ſuffer his ſoldiers to go aſhore, till two or three galleys, which he had ſent out to obſerve them, were returned with advice that they had ſeen the enemy land. The next day paſſed in the ſame manner, as did the third and fourth. Such a conduct, which argued reſerve and apprehenſion, extremely augmented the ſecurity and boldneſs of the Athenians, and inſpired them with an extreme contempt for an army, which fear, in their ſenſe, prevented from ſhowing themſelves, and attempting any thing.

Whilſt this paſſed, Alcibiades, who was near the fleet, took horſe, and came to the Athenian generals; to whom he repreſented, that they kept upon a very diſadvantageous coaſt, where there were neither ports nor cities in the neighbourhood; that they were obliged to bring their proviſions from Ceſtos with great danger and difficulty; and that they were very much in the wrong to ſuffer the ſoldiers and mariners of the fleet, as ſoon as they were aſhore, to ſtraggle and diſperſe themſelves at their own pleaſure, whilſt they were faced in view by the enemy's fleet, accuſtomed to execute the orders of their general with the readieſt obedience, and upon the ſlighteſt ſignal. He offered alſo to attack the enemy by land with a ſtrong body of Thracian troops, and to force them to a battle. The generals, eſpecially Tydeus and Menander, jealous of their command, did not content themſelves with refuſing his offers, from the opinion, that if the event proved unfortunate, the whole blame would fall on them, and if favourable, that Alcibiades alone would have the honour of it; but rejected alſo with inſult his wiſe and ſalutary council, as if a man in diſgrace loſt his ſenſe and abilities with the favour of the commonwealth. Alcibiades withdrew.

The fifth day the Athenians preſented themſelves again, and offered battle; retiring in the evening according to cuſtom with more inſulting airs than the days before. Lyſander, as uſual, detached ſome galleys to obſerve them, with orders to return with the

utmoſt

Ægospora-mos | Ægyptilla.

utmost digilence when they saw the Athenians landed, and to put up a brazen buckler at each ship's head as soon as they reached the middle of the channel. Himself in the mean time ran through the whole line in his galley, exhorting the pilots and officers to hold the seamen and soldiers in readiness to row and fight on the first signal.

As soon as the bucklers were put up in the ships heads, and the admiral galley had given the signal by the sound of trumpet, the whole fleet set forward in good order. The land-army at the same time made all possible haste to the top of the promontory to see the battle. The strait that separates the two continents in this place is about fifteen stadia, or three quarters of a league in breadth; which space was presently cleared through the activity and diligence of the rowers. Conon the Athenian general was the first who perceived from shore, the fleet advance in good order to attack him; upon which he immediately cried out for the troops to embark. In the height of sorrow and trouble, some he called to by their names, some he conjured, and others he forced to go on board their galleys; but all his endeavours and emotion were ineffectual, the soldiers being dispersed on all sides. For they were no sooner come on shore, than some ran to the sutlers, some to walk in the country, some to sleep in their tents, and others had begun to dress their suppers. This proceeded from a want of vigilance and experience in their generals, who, not suspecting the least danger, indulged themselves in taking their repose, and gave their soldiers the same liberty.

The enemy had already fallen on with loud cries and a great noise of their oars, when Conon, disengaging himself with nine galleys, of which number was the sacred ship called the *Paralian*, stood away for Cyprus, where he took refuge with Evagoras. The Peloponnesians, falling upon the rest of the fleet, took immediately the galleys which were empty, and disabled and destroyed such as began to fill with men. The soldiers, who ran without order or arms to their relief, were either killed in the endeavour to get on board, or flying on shore were cut to pieces by the enemy, who landed in pursuit of them. Lysander took 3000 prisoners, with all the generals, and the whole fleet. After having plundered the camp, and fastened the enemy's galleys to the sterns of his own, he returned to Lampsacus amidst the sound of flutes and songs of triumph. It was his glory to have atchieved one of the greatest military exploits recorded in history with little or no loss, and to have terminated a war in the small space of an hour, which had already lasted 27 years, and which, perhaps, without him, had been of much longer continuance.

ÆGYPT. See Egypt.

ÆGYPTIACUM, in pharmacy, the name of several detergent ointments; which are described under the article Ointnent.

ÆGYPTILLA, in natural history, the name of a stone described by the ancients, and said by some authors, to have the remarkable quality of giving water the colour and taste of wine. This seems a very imaginary virtue, as are indeed too many of those in former ages attributed to stones. The descriptions left us of this remarkable fossil tell us, that it was variegated with, or composed of, veins of black and white, or black and blueish, with sometimes a plate or vein of whitish red. The authors of these accounts seem to have understood by this name the several stones of the onyx, sardonyx, and camæa kind; all which we have at present common among us, but none of which possess any such strange properties.

Ægyptus | Æmilius.

ÆGYPTUS, (fab. hist.) was the son of Beleus, and brother of Danaus. See Belides.

ÆLINATÆ, in antiquity, a denomination given to the senators of Miletus, because they held their deliberations on board a ship, and never returned to land, till matters had been agreed on,

ÆLIAN (Claudius), born at Præneste in Italy. He taught rhetoric at Rome, according to Perizonius, under the Emperor Alexander Severus. He was sirnamed Μελιγλωσσος, *Honey-Mouth*, on account of the sweetness of his style. He was likewise honoured with the title of Sophist, an appellation in his days only given to men of learning and wisdom. He loved retirement, and devoted himself to study. He greatly admired and studied Plato, Aristotle, Isocrates, Plutarch, Homer, Anacreon, Archilochus, &c. and, though a Roman, gives the preference to the writers of the Greek nation. His two most celebrated works are, his Various History, and History of Animals. He composed likewise a book on Providence, mentioned by Eustathius; and another on divine Appearances, or The Declarations of Providence. There have been several editions of his Various History.

ÆLI PONS (anc. geog.) one of the fortresses near the wall or rampart, or, in the words of the Notitia, through the line of the hither wall; built, as is thought, by Adrian*. Now Porteland, (Camden), in Northumberland, between Newcastle and Morpeth.

*See *Adrian* (emperor).

ÆLIUS PONS, now *il Ponte S. Angelo*, a stone-bridge at Rome, over the Tyber, which leads to the Burgo and Vatican from the city, along Adrian's mole, built by the Emperor Adrian.

ÆLFRED. See Alfred.

ÆLURUS, in Egyptian mythology, the deity or god of cats; represented sometimes like a cat, and sometimes like a man with a cat's head. The Egyptians had so superstitious a regard for this animal, that the killing it, whether by accident or design, was punished with death: and Didorus relates, that, in the time of extreme famine, they chose rather to eat one another than touch these sacred animals.

AEM, Am, or Ame, a liquid measure used in most parts of Germany; but different in different towns; the aem commonly contains 20 vertils, or 80 masses; that of Heidelberg is equal to 48 masses; and that of Wirtembergh to 160 masses. See Aam.

ÆMILIUS (Paulus), the son of Lucius Paulus, who was killed at the battle of Cannæ, was twice consul. In his first consulate he triumphed over the Ligurians: and in the second subdued Perseus king of Macedonia, and reduced that country to a Roman province, on which he obtained the surname of Macedonicus. He returned to Rome loaded with glory, and triumphed for three days. He died 168 y ars before Christ.

Æmilius (Paulus), a celebrated historian, born at Verona, who obtained such reputation in Italy, that he was invited into France by the cardinal of Bourbon, in the

the reign of Lewis XII. in order to write the hiſtory of the Kings of France in Latin, and was given a canonry in the cathedral of Paris. He was near 30 years in writing that hiſtory, which has been greatly admired; and died at Paris on the 5th of May 1529.

ÆMOBOLIUM, in antiquity, the blood of a bull or ram offered in the ſacrifices, called *taurobolia* and *criobolia*; in which ſenſe the word occurs in ancient inſcriptions.

ÆNARIA (anc. geog.), an iſland on the bay of Cumæ, or over-againſt Cumæ in Italy, (Pliny.) It is alſo called *Inarime*, (Virgil); and now *Iſchia*: ſcarce three miles diſtant from the coaſt, and the promontory Miſenus to the weſt; 20 miles in compaſs; called *Pithecuſa* by the Greeks. It is one of the Oenotrides, and fenced round by very high rocks, ſo as to be inacceſſible but on one ſide; it was formerly famous for its earthen ware. See ISCHIA.

ÆNEAS (fab. hiſt.), a famous Trojan prince, the ſon of Anchiſes and Venus. At the deſtruction of Troy, he bore his aged father on his back, and ſaved him from the Greeks; but being too ſolicitous about his ſon and houſehold-gods, loſt his wife Creuſa in the eſcape. Landing in Africa, he was kindly received by queen Dido: but quitting her coaſt, he arrived in Italy, where he married Lavinia the daughter of king Latinus, and defeated Turnus, to whom ſhe had been contracted. After the death of his father-in-law, he was made king of the Latins, over whom he reigned three years: but joining with the Aborigines, he was ſlain in a battle againſt the Tuſcans. Virgil has rendered the name of this prince immortal, by making him the hero of his poem. See ÆNEID.

ÆNEAS SYLVIUS, (Pope). See PIUS II.

ÆNEATORES, in antiquity, the muſicians in an army, including thoſe who played trumpets, horns, &c. The word is formed from *æneus*, on account of the brazen inſtruments uſed by them.

ÆNEID, the name of Virgil's celebrated epic poem. The ſubject of the Æneid, which is the eſtabliſhment of Æneas in Italy, is extremely happy. Nothing could be more intereſting to the Romans than to look back to their origin from ſo famous a hero While the object was ſplendid itſelf, the traditionary hiſtory of his country opened intereſting fields to the poet; and he could glance at all the future great exploits of the Romans, in its ancient and fabulous ſtate.

Blair's Lectures.

As to the unity of action, it is perfectly well preſerved in the Æneid. The ſettlement of Æneas, by the order of the gods, is conſtantly kept in view. The epiſodes are linked properly with the main ſubject. The nodus, or intrigue of the poem, is happily managed. The wrath of Juno, who oppoſes Æneas, gives riſe to all his difficulties, and connects the human with the celeſtial operations throughout the whole poem.

One great imperfection of the Æneid, however, is, that there are almoſt no marked characters in it. Achates, Cloanthes, Gyas, and other Trojan heroes who accompanied Æneas into Italy, are inſipid figures. Even Æneas himſelf is without intereſt. The character of Dido is the beſt ſupported in the whole Æneid.

The principal excellency of Virgil is tenderneſs. His ſoul was full of ſenſibility. He muſt have felt himſelf all the affecting circumſtances in the ſcenes he deſcribes; and he knew how to touch the heart by a ſingle ſtroke. In an epic poem this merit is the next to ſublimity. The ſecond book of the Æneid is one of the greateſt maſter pieces that ever was executed. The death of old Priam, and the family-pieces of Æneas, Anchiſes, and Creuſa, are as tender as can be conceived. In the fourth book, the unhappy paſſion and death of Dido are admirable. The epiſodes of Pallas and Evander, of Niſus and Euryalus, of Lauſus and Mezentius, are all ſuperlatively fine.

In his battles, Virgil is far inferior to Homer. But in the important epiſode, the deſcent into hell, he has outdone Homer by many degrees. There is nothing in antiquity to equal the ſixth book of the Æneid.

ÆNGINA, one of the iſlands of the Archipelago. It lies in the bay of Engia, and the town of that name contains about 800 houſes and a caſtle; and near it are the ruins of a magnificent ſtructure, which was probably a temple.

ÆNIGMA, denotes any dark ſaying, wherein ſome well-known thing is concealed under obſcure language. The word is Greek, Αινιγμα, formed of αινιττεσθαι, *obſcure innuere*, to hint a thing darkly, and of αινος, an obſcure ſpeech or diſcourſe. The popular name is *riddle*; from the Belgic *raeden*, or the Saxon *aræthan*, to interpret. Fa. Bouhours, in the memoirs of Trevoux, defines an ænigma, A diſcourſe, or painting, including ſome hidden meaning, which is propoſed to be gueſſed.

Painted ÆNIGMAS, are repreſentations of the works of nature, or art, concealed under human figures, drawn from hiſtory, or fable.

A Verbal ÆNIGMA, is a witty, artful, and abſtruſe deſcription of any thing.—In a general ſenſe, every dark ſaying, every difficult queſtion, every parable, may paſs for an *ænigma*. Hence obſcure laws are called *Ænigmata Juris*. The alchemiſts are great dealers in the ænigmatic language, their proceſſes for the philoſophers ſtone being generally wrapped up in riddles: e. g. *Fac ex mare et fæmina circulum, inde quadrangulum, hinc triangulum, fac circulum, et habebis lapidem philoſophorum.*—F. Meneſtrier has attempted to reduce the compoſition and reſolution of ænigmas to a kind of art, with fixed rules and principles, which he calls the philoſophy of *ænigmatic* images.

The Subject of an ÆNIGMA, or the thing to be concealed and made a myſtery of, he juſtly obſerves, ought not to be ſuch in itſelf; but, on the contrary, common, obvious, and eaſy to be conceived. It is to be taken, either from nature, as the heavens, or ſtars; or from art, as painting, the compaſs, a mirror, or the like.

The Form of ÆNIGMAS conſiſts in the words, which, whether they be in proſe or verſe, contain either ſome deſcription, a queſtion, or a proſopopæia. The laſt kind are the moſt pleaſing, inaſmuch as they give life and action to things which otherwiſe have them not. To make an ænigma, therefore, two things are to be pitched on, which bear ſome reſemblance to each other; as the ſun and a monarch; or a ſhip and a houſe: and on this reſemblance is to be raiſed a ſuperſtructure of contrarieties to amuſe and perplex. It is eaſier to find great ſubjects for ænigmas in figures than in words, inaſmuch as painting attracts the eyes and excites the attention to diſcover the ſenſe. The ſubjects of enigmas in painting, are to be taken either from hiſtory or fable: the compoſition here is a kind of metamorphoſis, Ænigma. tamorphosis, wherein, e. g. human figures are changed into trees, and rivers into metals. It is essential to ænigmas, that the history or fable under which they are presented, be known to every body; otherwise it will be two ænigmas instead of one; the first of the history or fable, the second of the sense in which it is to be taken. Another essential rule of the ænigma is, that it only admits of one sense. Every ænigma which is susceptive of different interpretations, all equally natural is so far imperfect. What gives a kind of erudition to an ænigma, is an invention of figures in situations, gestures, colours, &c. authorised by passages of the poets, the customs of artists in statues, basso relievos, inscriptions, and medals.—In foreign colleges,

The explication of ÆNIGMAS makes a considerable exercise; and that one of the most difficult and amusing, where wit and penetration have the largest field.—By explaining an ænigma, is meant the finding a motto corresponding to the action and persons represented in a picture, taken either from history or mythology. The great art of this exercise consists in the choice of a motto, which either by itself, or the circumstances of time, place, person who speaks, or those before whom he is speaking, may divert the spectators, and furnish occasion for strokes of wit; also in showing to advantage the conformities between the figure and thing figured; giving ingenious turns to the reasons employed to support what is advanced, and in artfully introducing pieces of poetry to illustrate the subject and awaken the attention of the audience.

As to the solution of ænigmas, it may be observed, that those expressed by figures are more difficult to explain than those consisting of words, by reason images may signify more things than words can; so that to fix them to a particular sense, we must apply every situation, symbol, &c. and without omitting a circumstance.—As there are few persons in history, or mythology, but have some particular character of vice or virtue, we are, before all things, to attend to this *character*, in order to divine what the figure of a person represented in a painting signifies, and to find what agreement this may have with the subject whereof we would explain it. Thus, if Proteus be represented in a picture, it may be taken to denote *inconstancy*, and applied either to a physical or moral subject, whose character is to be changeable; e. g. an almanack, which expresses the weather, the seasons, heat, cold, storms, and the like. The *colours* of figures may also help to unriddle what they mean: *white*, for instance, is a mark of innocence, *red* of modesty, *green* of hope, *black* of sorrow, &c. When figures are accompanied with *symbols*, they are less precarious; these being, as it were, the soul of ænigmas, and the key that opens the mystery of them. Of all the kinds of symbols which may be met with in those who have treated professedly on the subject, the only truly ænigmatical are those of Pythagoras, which, under dark proverbs, hold forth lessons of morality; as when he says, *Stateram ne transilias*, to signify, Do no injustice.

But it must be added, that we meet with some ænigmas in history, complicated to a degree, which much transcends all rules, and has given great perplexity to the interpreters of them. Such is that celebrated ancient one *Ælia Lælia Crispis*, about which many of the learned have puzzled their heads. There are two exemplars of it: one found 140 years ago, on a marble near Bolognia: the other in an ancient MS. written in Gothic letters, at Milan. It is controverted between the two cities, which is to be reputed the more authentic.

The Bononian *Ænigma.*
D. M.
Ælia Lælia Crispis,
Nec vir, nec mulier,
Nec androgyna;
Nec puella, nec juvenis,
Nec anus;
Nec casta, nec meretrix,
Nec pudica;
Sed omnia:
Sublata
Neque fame, neque ferro,
Neque veneno;
Sed omnibus:
Nec cælo, nec terris,
Nec aquis,
Sed ubique jacet.
Lucius Agatho Priscius,
Nec maritus, nec amator,
Nec necessarius;
Neque mærens, neque gaudens,
Neque flens;
Hanc,
Nec molem, nec pyramidem,
Nec sepulchrum,
Sed omnia,
Scit et nescit, cui posuerit.

That is to say, *To the gods manes, Ælia Lælia Crispis, neither man, or woman, nor hermaphrodite; neither girl, nor young woman, nor old; neither chaste, nor a whore; but all these: killed neither by hunger, nor steel, nor poison; but by all these: rests neither in heaven, nor on earth nor in the waters; but every where. Lucius Agatho Priscius, neither her husband, nor lover, nor friend; neither sorrowful, nor joyful, nor weeping, certain or uncertain, to whom he rears this monument, neither erects her a temple, nor a pyramid, nor a tomb, but all these.* In the MS. at Milan, instead of *D. M.* we find *A. M. P. P. D.* and at the end the following addition:

Hoc est sepulchrum intus cadaver non habens,
Hoc est cadaver sepulchrum extra non habens,
Sed cadaver idem est et sepulchrum

We find near 50 several solutions of this ænigma advanced by learned men. Marius Michael Angelus maintains *Ælia Lælia Crispis* to signify rain-water falling into the sea. Ri. Vitus first explained it of Niobe turned to a stone, afterwards of the rational soul, and afterwards of the Platonic idea; Jo. Turrius, of the *materia prima*; Fr. Schottus, of an eunuch; Nic. Bernardus, of the philosophers-stone, in which he is followed by Borrichius; Zach. Pontinus, of three human bodies in the same situation, and buried by three different men at the same time; Nesmondius, of a law-suit; Jo. Gas. Gerartius, of love; Zu. Boxhornius, of a shadow; P. Terronus, of music, Fort Licetus, of generation, friendship, and privation: M. Cy. Montalbanus, of hemp; Car. Cæs. Malvasia, of an abortive girl promised in marriage; Pet. Mengulus, of the rule of chastity, prescribed by the founder of the

military

military religion of St Mary; M. de Ciconia, of pope Joan; Heumanus, of Lot's wife; and lastly, J. C. S. an anonymous writer in the Leipsic Acts, of the Christian church.

ÆNIGMATOGRAPHY, or ÆNIGMATHOLOGY, the art of resolving or making ænigmas.

ÆNONA (anc. geog.), a city of Liburnia, called by Pliny *Civitas Irasini*, the reason of which is unknown; also *Enona*, and is now called *Nona*; on the Adriatic, by which it is for the greater part surrounded; over-against the island Gissa, from which it is distant four miles to the west. E. Long. 16°, Lat. 28°.

ÆNUS (anc. geog.), now the *Inn*, a river of Germany, which, rising in the country of the Grisons, out of the Alps, in the district called Gottes-haus-punt, runs through the Grisons, the county of Tyrol, the duchy of Bavaria, and through Passau into the Danube.

ÆNUS, *Ænos*, or *Ænum* (anc. geog.), a town of Thrace, situate on the east-most mouth of the Hebrus, which has two mouths; and said to be built by the Cumeans. It was a free town, in which stood the tomb of Polydorus, (Pliny); *Ænius* is the epithet. Here the brother of Cato Uticensis died, and was honoured with a monument of marble in the forum of the Ænii, (Plutarch); called *Ænei*, (Stephanus); Livy says that the town was otherwise called *Absynthus*. Now *Eno*.

ÆNITHOLOGIUS, in poetry, a verse of two dactyls and three trochæi; as, *Praelia dira placent truci juventae*.

ÆOLIÆ INSULÆ, now *Isole di Lipari*, (anc. geog.), seven islands, situated between Sicily and Italy, so called from Æolus, who reigned there about the time of the Trojan war. The Greeks call them *Hephaestiades*; and the Romans *Vulcaniae*, from their fiery eruptions. They are also called *Liparaeorum Insulae*, from their principal island Lipara. Dionysius Periegetes call them πλωται because circumnavigable.

ÆOLIC, in a general sense, denotes something belonging to Æolis.

ÆOLIC, or ÆOLIAN, in grammar, denotes one of the five dialects of the Greek tongue. It was first used in Bœotia; whence it passed into Æolia, and was that which Sappho and Alcæus wrote in. The Æolic dialect generally throws out the aspirate or sharp spirit, and agrees in so many things with the DORIC dialect that the two are usually confounded together.

Æolic digama is a name given to the letter F which the Æolians used to prefix to words beginning with vowels as Fοινος, for οινος; also to insert between vowels, as οFις, for οις.

ÆOLIC *Verse*, in prosody, a verse consisting of an iambus, or spondee; then of two anapests, separated by a long syllable; and, lastly, of another syllable. Such as, *O stelliferi conditor orbis*. This is otherwise called *eulogic* verse; and, from the chief poets who used it, *Archilochian* and *Pindaric*.

ÆOLIPILE, in hydraulics, is a hollow ball of metal, generally used in courses of experimental philosophy, in order to demonstrate the possibility of converting water into an elastic steam or vapour by heat. The instrument therefore, consists of a slender neck, or pipe, having a narrow orifice inserted into the ball by means of a shouldered screw. This pipe being taken out, the ball is filled almost full of water, and the pipe being again screwed in, the ball is placed on a pan of kindled charcoal, where it is well heated, and there issues from the orifice a vapour, with prodigious violence and great noise, which continues till all the included water is discharged. The stronger the fire is, the more elastic and violent will be the steam; but care must be taken that the small orifice of the pipe be not, by any accident, stopped up; because the instrument would in that case infallibly burst in pieces, with such violence as may greatly endanger the lives of the persons near it. Another way of introducing the water is to heat the ball red-hot when empty, which will drive out almost all the air; and then by suddenly immerging it in water, the pressure of the atmosphere will force in the fluid, till it is nearly full. Des Cartes and others have used this instrument to account for the natural cause and generation of the wind: and hence it was called *Æolopila*: q. d. *pila Æoli*, the ball of Æolus or of the god of the winds.

ÆOLIS, or ÆOLIA (anc. geog), a country of the Hither Asia, settled by colonies of Æolian Greeks. Taken at large, it comprehends all Troas, and the coast of the Hellespont to the Propontis, because in those parts there were several Æolian colonies: more strictly, it is situated between Troas to the north, and Ionia to the south. The people are called *Æoles*, or *Æolii*.

ÆOLIUM MARE (anc. geog.), a part of the Egean sea, washing Æolis; called also *Mysium*, from Mysia. Now called, *Golfo di Smyrna*.

ÆOLUS in heathen mythology, the god of the winds, was said to be the son of Jupiter by Acasta, or Sigesia, the daughter of Hippotus; or, according to others the son of Hippotus by Meneclea, daughter of Hyllus king of Lipara. He dwelt in the island Strongyle, now called *Strombolo*, one of the seven islands called *Æolian* from their being under the dominion of Æolus. Others say, that his residence was at Regium, in Italy; and others again place him in the island Lipara. He is represented as having authority over the winds, which he held enchained in a vast cavern to prevent their continuing the devestations they had been guilty of before they were put under his direction. Mythologists explain the original of these fables, by saying, that he was a wise and good prince; and, being skilled in astronomy, was able, by the flux and reflux of the tides, and the nature of the volcano in the island Strongyle, to foretel storms and tempests.

Harp of ÆOLUS, or the Æolian lyre. See ACOUSTICS, n° 10.

ÆON, a Greek word, properly signifying the age or duration of any thing.

ÆON, among the followers of Plato, was used to signify any virtue, attribute, or perfection: hence they represented the deity as an assemblage of all possible æons; and called him *pleroma*, a Greek term signifying *fulness*. The Valentinians, who, in the first ages of the church, blended the conceits of the Jewish cabalists, the Platonists, and the Chaldean philosophers, with the simplicity of the Christian doctrine, invented a kind of Theogony, or Genealogy of Gods (not unlike that of Hesiod), whom they called by several glorious names, and all by the general appellation of ÆONS; among which they reckoned Ζωη, *Life*; Λογος, *Word*; Μονογενης, *Only-begotten*; Πληρωμα, *Fulness*; and many other divine powers and emanations, amounting in in number to thirty; which they fancied to be successively derived from one another; and all from one self-originated deity, named *Bythus*, i.e. *profound* or *unfathomable*; whom they called likewise, *The most high and ineffable Father*. See VALENTINIANS.

ÆORA, among ancient writers on medicine, is used for gestation; which sort of exercise was often prescribed by the physicians of those days. Other exercises consisted principally in the motion of the body; but in the *æora* the limbs were at rest, while the body was carried about and moved from place to place, in such a manner as the physician prescribed. It had therefore the advantages of exercise, without the fatigue of it.—This exercise was promoted several ways: sometimes the patient was laid in a sort of hammock, supported by ropes, and moved backward and forward; sometimes his bed run nimbly on its feet. And beside these, the several ways of travelling were accounted species of the *æora*, whether in the litter, in a boat or ship, or on even ground in a chariot.—Asclepiades was the first who brought gestation into practice, which was used as a means to recover strength after a fever, &c.

ÆQUANA JUGA, (anc. geog.); mountains of Picenum, in the kingdom of Naples, now called *Montagna di Sorrento*, denominated from the town Æqua, which being destroyed, was replaced by Vicus, now *Vico di Sarrento*; called also *Æquana*, Sil. Italicus.

ÆQUIMELIUM, in antiquity, a place in Rome, where stood the house of Spurius Melius, who, by largesses corrupting the people, affected the supreme power: refusing to appear before the dictator Cincinnatus, he was slain by Servilius Ahala, master of the horse; his house was razed to the ground; and the spot on which it stood was called *Area Equimelii*. (Livy.)

ÆRA, in chronology, a fixed point of time from whence any number of years is begun to be counted.

It is sometimes also written in ancient authors *Era*. The origin of the term is contested, though it is generally allowed to have had its rise in Spain. Sepulveda supposed it formed from A. ER. A. the notæ or abbreviatures of the words, *annus erat Augusti*, occasioned by the Spaniards beginning their computation from the time their country came under the dominion of Augustus, or that of receiving the Roman calendar. This, opinion, however ingenious, is rejected by Scaliger, not only on account that in the ancient abbreviatures *A* never stood for *annus*, unless when preceded by *V* for *vixit*; and that it seems improbable they should put ER for *erat*, and the letter A, without any discrimination, both for *annus* and *Augustus*. Vossius neverthelefs favours the conjecture, and judges it at least as probable, as either that of Isidore, who derives *æra* from *æs*, the tribute-money," wherewith Augustus taxed the world: or that of Scaliger himself, who deduces it likewise from *æs*, though in a different manner. *Æs*, he observes, was used among the ancients for an *article* or *item* in an account; and hence it came also to stand for a sum or number itself. From the plural *æra*, came by corruption *ra*, *æram*, in the singular; much as *Osti*, *Ostiam*, the name of a place, from *Ostia*, the mouths of the Tyber.

The difference between the terms *æra* and *epoch* is, that the æras are certain points fixed by some people, or nation; and the epochs are poins fixed by chronologists and historians. The idea of an æra comprehends also a certain succession of years proceeding from a fixed point of time, and the epoch is that point itself. Thus the Christian æra began at the epoch of the birth of Jesus Christ. See CHRONOLOGY, where the different Æras, &c. are enumerated and explained.

ÆRARIUM, the treasury or place where the public money was deposited amongst the Romans.

ÆRARIUM *Sanctius* contained the monies arising from the twentieth part of all legacies: this was kept for the extreme necessities of the state.

ÆRARIUM *Privatum* was the emperor's privy purse, or the place where the money arising from his private patrimony was deposited.

ÆRARIUM *Vicesimarum*, the place where the money arising from the taxes levied from foreign countries was laid up, so called because it most commonly consisted of a twentieth part of the produce.

ÆRARIUM *Ilithyae*, or *Junonis Lucinae*, was where the monies were deposited which parents paid for the birth of each child.

There are several other treasuries mentioned in history, as the *ærarium Juventutis*, *Veneris*, &c. The temple of Saturn was the public treasury of Rome, either because Saturn first taught the Italians to coin money, or, which is most likely, because this temple was the strongest and most secure, and therefore the fittest place for that purpose.

Ærarium differs from *fiscus*, as the first contained the public money, the second that of the prince. The two are, however, sometimes indiscriminately used for each other.

ÆRARIUS, a name given by the Romans to a degraded citizen, who had been struck off the list of his century. Such persons were so called because they were liable to all the taxes (*æra*), without enjoying any of its privileges.

The *ærarii* were incapable of making a will, of inheriting, of voting in assemblies, of enjoying any post of honour or profit; in effect, were only subject to the burdens, without the benefits of society; yet they retained their freedom, and were not reduced to the condition of slaves. To be made an *ærarius* was a punishment inflicted for some offence, and reputed one degree more severe than to be expelled a tribe, *tribu moveri*.

ÆRARIUS was also an officer instituted by Alexander Severus, for the distribution of the money given in largesses to the soldiery, or people.

ÆRARIUS was also used for a person employed in coining or working brass.

These are sometimes called *ærarii fusores*: at other times, *ærarius* is distinguished from *fusor*; the former answering to what we now call copper-smiths, the latter to founders.

ÆRARIUS was likewise applied to a soldier who receives pay.

AERIA, or EERIA (anc. geog.), the ancient name of Egypt: the scholiast on Apollonius Rhodius, says, that not only Thessaly, but Egypt, was called Ἠερία by the Greeks, which Eusebius also confirms: and hence Apollinarius, in his translation of the 114th Psalm, uses it for Egypt. Hesychius applies this name to Ethiopia.

AERIAL,

Aerial, Aerians.

AERIAL, in a general sense, denotes something partaking of the nature of air; thus, aërial substance, aërial particles, &c.

Aerial Perspective. See PERSPECTIVE and PAINTING.

AERIANS, in church history, a branch of Arians, who, to the doctrines of that sect, added some peculiar dogmas of their own; as, that there is no difference between bishops and priests; a doctrine maintained by many modern divines, particularly of the presbyterian and reformed churches. The sect received its denomination from Aerius an Armenian priest of the fourth century. He founded his doctrine chiefly upon some passages in St Paul; and, among others, upon that in 1 Tim. iv. 14. where the apostle exhorts him not to neglect *the gift he had received by the laying on of the hands of the Presbytery.* Here, observes Aerius, are no mention of bishops: on the contrary, Timothy evidently received his ordination from the presbyters or priests.—Epiphanius zealously maintains the superiority of bishops against the Aerians. The word *presbytery*, used by the apostle, he observes, includes both bishops and priests; the whole senate or assembly of the ecclesiastics of the place.

Flos Æris, Ærography.

FLOS ÆRIS, among alchemists, small scales procured from copper melted by a strong heat; it is sometimes used for ærugo or verdigrise.

AEROGRAPHY, from αηρ, *air*, and γραφω, *I describe*; a description of the air, or atmosphere, its limits, dimensions, properties, &c.—This amounts to much the same with aerology, unless we suppose the latter to enter into the rational, and the former to confine itself to a description of the more obvious affections thereof. See ATMOSPHERE.

AEROLOGY,

THE doctrine or science of AIR, its nature and different species, with their ingredients, properties, phenomena, and uses.

Air, in a general sense, is that invisible fluid everywhere surrounding the globe; on which depends not only animal but vegetable life; and which seems, in short, to be one of the great agents employed by nature in carrying on her operations throughout the world.

Though the attention of philosophers has in all ages been engaged in some measure by inquiries concerning the nature of the atmosphere, yet till within these last 30 years, little more than the mere mechanical action of this fluid was discovered, with the existence of some anomalous and permanently elastic vapours, whose properties and relation to the air we breathe were almost entirely unknown. Within the abovementioned period, however, the discoveries concerning the constituent parts of the atmosphere itself, as well as the nature of the different permanently elastic fluids which go under the general name of *air*, have been so numerous and rapid, that they have at once raised this subject to the dignity of a *Science*, and now form a very considerable, as well as important, part of the modern system of natural philosophy.

Utility of the subject.

Those discoveries, indeed, have not been more interesting to philosophers, than useful to science and beneficial to society. Many perplexing processes in chemistry have been explained in consequence of them, several have been facilitated, and a number of new and useful ones have been introduced. The phenomena attending metallic calcinations and reductions have been greatly elucidated. The knowledge of the use of the air in respiration; the method of ascertaining its purity and fitness for that function; the investigation of dephlogisticated air; the method of impregnating water with fixed air; are all calculated to answer purposes of the highest utility. The medicinal properties of fixed air have been in a great measure ascertained, and its antiseptic qualities in other respects promise to be of considerable advantage. The method of ascertaining the purity of the air of a place, and the manner of ventilating an apartment, are of great use for those concerned in public buildings. In short, there is perhaps no station in life where some knowledge of this subject may not be of use.

SECT. I. *Of the general Constitution, Mechanical Properties, and Operations of the Air.*

1 Ancient opinions concerning the air.

§ 1. *The general Constitution of the Air we breathe.*—For many ages this fluid was supposed to be simple and homogeneous; its common operations to depend on its heat, cold, moisture, or dryness; and any effects which could not be explained by these (such as the appearance of pestilential diseases), were reckoned to be entirely supernatural, and the immediate effects of Divine power. But, however simple and homogeneous this fluid may have been thought in former times, it is so far from possessing the simplicity of an element, that it is the receptacle of all kinds of effluvia produced from terrestrial substances either naturally or artificially. Hence, whatever maybe the nature of the aërial fluid when absolutely pure, that which we breathe, and commonly goes under the name of *air*, must be considered as an exceedingly heterogeneous mixture, various at various times, and which it is by no means possible to analise with accuracy.

2 Common air a very heterogeneous fluid.

3 In what manner it purifies itself.

Though, in this view, air seems to be a kind of sink or common sewer, where all the poisonous effluvia arising from putrid and corrupted matters are deposited; yet it has a wonderful facility of purifying itself, and one way or other of depositing those vapours contained in it; so that it never becomes noxious except in particular places, and for a short time; the general mass remaining upon all occasions pretty much the same. The way in which this purification is effected is different, according to the nature of the vapour with which the air is loaded. That which most universally prevails is water; and from experiments it appears, that the quantity of aqueous vapour contained in the atmosphere is immense. Dr Halley, from an experiment on the evaporation from a fluid surface heated to the same degree with that given by our meridian sun, has calculated, that the evaporation from the Mediterranean sea is alone sufficient to yield all the water of the

4 Vast quantities of water continually discharged into it by evaporation.

Of Air in general.

the rivers which ran into it. Dr. Watſon, in his Chemical Eſſays, has given an account of ſome experiments made with a view to determine the quantity of the water raiſed from the earth itſelf in time of drought. He informs us, that, when there had been no rain for above a month, and the graſs was become quite brown and parched, the evaporation from an acre was not leſs than 1600 gallons in 24 hours. Making afterwards two experiments, when the ground had been wetted by a thunder-ſhower the day before, the one gave 1973, the other 1905, gallons in 12 hours. From this the air is every moment purified by the aſcent of the vapour, which flying off into the clouds, thus leaves room for the exhalation of freſh quantities; ſo that as the vapour is conſiderably lighter than the common atmoſphere, and of conſequence aſcends with greater velocity, the air during all this time is ſaid to be *dry*, notwithſtanding the vaſt quantity of aqueous fluid that paſſes through it.

5 Different kinds of vapours which contaminate it.

Nor is it only from the aqueous vapour that the air is purified at this time. Much of that vapour ariſing from decayed and putrid animal and vegetable ſubſtances, and which by ſome modern philoſophers is called *phlogiſton*, attaches itſelf to the aqueous vapour, and aſcends along with it. Another part is abſorbed by vegetables; for the phlogiſtic vapour, as is ſhown under AGRICULTURE, n° 5. is probably the food of plants. The phlogiſtic vapours which aſcend along with the water, probably continue there and deſcend along with the rain; whence the fertilizing qualities of rain-water above thoſe of any other. Thus we may ſee why a dry air, whether cold or hot, muſt always be wholeſome; but as the atmoſphere cannot always *receive* vapours, it is obvious, that when great rains come on, eſpecially if attended with heat, the lower regions of the air muſt be overloaded with vapours both of the aqueous and phlogiſtic kind, and of conſequence be very unwholeſome.

But beſides the aqueous and phlogiſtic vapours, both of which are ſpecifically lighter than common air, there are others, which, being ſpecifically heavier, cannot be carried off in this manner. Hence theſe groſs vapours contaminate certain places of the atmoſphere, rendering them not only unhealthy, but abſolutely poiſonous. Of theſe are, 1. Sulphureous, acid, and metalline exhalations. Theſe are produced principally by volcanoes; and as they deſcend, in conſequence of their ſpecific gravity, they ſuffocate and ſpread deſtruction all around them, poiſoning not only animals, but vegetables alſo. 2. The vapours ariſing from houſes where lead and other metals are ſmelted, have the ſame pernicious qualities; inſomuch that the men who breathe them, the cattle who eat the graſs, and the fiſhes who inhabit the waters on which they fall, are poiſoned by them if taken into the body in a certain proportion. 3. Of the ſame kind are the *mofetes*, or emanations of fixed air, which ſometimes proceed from old lavas, or perhaps from ſome other places even of the ſurface. From all theſe the air ſeems not capable of purifying itſelf, otherwiſe than either by diſperſing them by winds, or by letting them ſubſide by their ſuperior gravity, till they are abſorbed either by the earth or water, according as it is their nature to unite with one or other of theſe elements. 4. Of this kind alſo ſeem to be the vapours which are called properly *peſtilential*. The contagion of the plague itſelf ſeems to be of an heavy ſluggiſh nature, incapable of ariſing in the air, but attaching itſelf to the walls of houſes, bed-cloths, and wearing apparel. Hence ſcarce any conſtitution of the atmoſphere can diſpel theſe noxious effluvia; nor does it ſeem probable that peſtilential diſtempers ever ceaſe until the contagion has operated ſo long, and been ſo frequently communicated from one to another, that, like a ferment much expoſed to the atmoſphere, it becomes vapid, communicates a milder infection, and at laſt loſes its ſtrength altogether.

6 Specific gravity of the air.

§ 2. *Mechanical Properties of the* AIR.—In common with water, the air we breathe poſſeſſes *gravity*, and conſequently will perform every thing in that way which water can do, making allowance for the great difference between the ſpecific gravity of water and of air. This difference indeed is exceedingly great, and has been variouſly calculated. Ricciolus eſtimates the gravity of air to be to that of water as 1 to 1000; Merſennus, as 1 to 1300, or 1 to 1356; Lana, as 1 to 640; and Galileo, only as 1 to 400. Mr Boyle, by more accurate experiments makes the air at London to be to water as 1 to 983; and thinks, that, all things conſidered, the proportion of 1 to 1000 may be taken as a medium. But by three experiments made ſince that time before the Royal Society, the ſpecific gravity of the air was determined to be to that of water as 1 to 840, 852, and 860. By a very accurate experiment, Mr. Haukſbee fixed the proportion as 1 to 885. But as all theſe experiments were made when the barometer was at 29½ inches, Dr Jurin ſuppoſes, that, at a medium between heat and cold, when the barometer is 30 inches high, the proportion between the two fluids may be taken as one to 800; and this agrees with the obſervations of the Hon. Mr Cavendiſh, made when the barometer was 29½ inches, and the thermometer at 50.

7 Effects of the gravity of the air.

By means of its gravity, the air preſſes with great force upon all bodies, according to the extent of their ſurface. M. Paſcal has computed the quantity of this preſſure to be no leſs than 2232 pounds upon every ſquare foot of ſurface, or upwards of 15 pounds on every ſquare inch. According to ſome expriments made by M. Amontons and de la Hire, a column of air on the ſurface of the earth, and 36 fathoms high, is equal in weight to three lines depth of mercury. From the barometer, however we know that the whole preſſure of the atmoſphere is very different; ſometimes being equal only to a column of 28 inches, and varying from thence to 31 inches. The whole quantity of preſſure muſt thus be be immenſe, and has been computed equal to a globe of lead 60 miles in diameter.

By means of its gravity, the atmoſphere accompliſhes many uſeful purpoſes in nature. It prevents the arterial veſſels of animals and the ſap-veſſels of plants from being too much diſtended by the expanſive power (whatever it is). which has a perpetual tendency to ſwell them out. Thus we ſee, that, in the operation of cupping, where the preſure of the air is taken off from a particular part, the expanſive force inſtantly acts, and ſwells out the veſſels to a great degree. Hence alſo, when animals are put into an air-pump, their whole bodies ſwell.

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By its gravity, the air promotes the union of fluid bodies, which would instantly cease *in vacuo*. Thus oils and salts, which remain united in air, separate as soon as that fluid is extracted. Hence also, when hot water is put under an exhausted receiver, it boils violently; because the pressure of the air being now taken of, the particles of steam, which existed invisibly among the water, and which the gravity of the atmosphere prevented from flying off so soon, are now hurried up with great velocity, by means of the excessive comparative gravity of the aqueous fluid.

8 Elasticity of the air.

On the gravity of the air depend the ascent of water in pumps, syphons, &c. and likewise all the phenomena of the barometer.

Besides its gravity, which the air has in common with water and other fluids, there is another which it has only in common with steam or vapour. This is called its *elasticity*; by which, like a spring it allows itself to be compressed into a smaller bulk, and then returns again to its original size upon removing the pressure.

The elasticity of the air was first ascertained by some experiments of lord Bacon, who, upon this principle, constructed the first thermometer, which he called his *vitrum calendare*. Of this power we have numerous proofs. Thus a blown bladder being squeezed in the hand, we find the included air sensibly resist; so that, upon ceasing to compress, the cavities or impressions made in its surface are readily expanded again and filled up.

The structure and office of the *Air*-Pump depend on this elastic property. Every particle of air always exerts a nisus or endeavour to expand, and thus strives against an equal endeavour of the ambient particles; whose resistance happening by any means to be weakened, it immediately diffuses itself into an immense extent. Hence it is that thin glass bubbles, or bladders filled with air, and exactly closed, being included in the exhausted receiver of an air-pump, burst by the force of the air they contain; and a bladder almost quite flaccid, swells in the receiver and appears full. The same effect also takes place, though in a smaller degree, on carrying the flaccid bladder to the top of an high mountain.

9 Whether this property can be diminished.

It has been questioned among philosophers, whether this elastic power of the air is capable of being destroyed or diminished. Mr Boyle made several experiments with a view to discover how long air would retain its spring after having assumed the greatest degree of expansion his air-pump would give it; but he was never able to observe any sensible dimunition. Desaguliers found, that air, after having been inclosed for half a year in a wind-gun, had lost none of its elasticity; and Roberval, after preserving it in the same manner for 16 years, observed, that its expansive projectile force was the same as if it had been recently condensed. Neverthelefs, Mr Hauksbee concludes, from a later experiment, that the spring of the air may be disturbed by a violent pressure, in such a manner as to require some time to return to its natural tone. Dr Hales interred, from a number of experiments, that the elasticity of the air is capable of being impaired and diminished by a variety of causes.

The weight or pressure of the air has no dependence on its elasticity; but would be the same whether it had such a property or not. The air, however, being elastic, is necessarily affected by the pressure, which reduces it into such a space, that the elasticity, which reacts against the compressing weight, is equal to that weight. In effect, the law of this elasticity is, that it increases as the density of the air increases; and the density increases as the force increases by which it is pressed. Now there must necessarily be a balance between the action and re-action: i. e. the gravity of the air which tends to compress it, and the elasticity by which it endeavours to expand, must be equal. Hence the elasticity increasing, or diminishing universally, as the density increases or diminishes, it is no matter whether the air be compressed and retained in such a space by the weight of the atmosphere, or by any other means; it must endeavour in either case to expand with the same force. And hence, if air near the earth be pent up in a vessel, and all communication with the external fluid cut off, the pressure of the inclosed air will be equal to the weight of the atmosphere at the time the quantity was confined. Accordingly, we find mercury sustained to the same height, by the elastic force of air inclosed in a glass vessel, as by the whole atmospherical pressure. On the same principle air may be artificially condensed; and hence the structure of the Air-*Gun*.

10 Utmost limits of its condensation and expansion.

The utmost limits to which air, of the density which it possesses at the surface of the earth, is capable of being compressed, have not been ascertained. Mr Boyle made it 13 times more dense; Dr Halley says that he has seen it compressed so as to be 60 times denser than in its natural state, which is farther confirmed by M. Papin and M. Huygens. Dr Hales, by means of a press, condensed it 38 times; and by forcing water in an iron ball or globe, into 1551 times less space than it naturally occupies. However, Dr Halley has asserted, in the Philosophical Transactions, Abr. vol. ii. p. 17. that from the experiments made at London, and by the academy del Cimento at Florence, it might be safely concluded, that no force whatever is able to reduce air into 800 times less space than that which it naturally possesses on the surface of our earth. In answer to this, M. Amontons, in the Memoirs of the French Academy, maintains, that there is no fixing any bounds to its condensation; that greater and greater weights will still reduce it into less and less compass: that it is only elastic in virtue of the fire which it contains; and that as it is impossible ever to drive all the fire out of it, it is impossible ever to make the utmost condensation.

The dilation of the air, by virtue of its elastic force, is found to be very surprising; and yet Dr. Wallis suggests, that we are far from knowing the utmost of which it is capable. It several experiments made by Mr. Boyle, it dilated first into nine times its former space; then into 31 times; than into 60; then into 150. Afterwards it was brought to dilate into 8000 times its space, then into 10,000, and even at last into 13,679 times its space; and this altogether by its own expansive force, without the help of fire. On this depend the structure and use of the Manometer.

Hence it appears, that the air we breathe near the surface of the earth is compressed by its own weight into at least the 13,679th part of the space it would possess *in vacuo*. But if the same air be condensed by art,

art, the ſpace it will take up when moſt dilated, to that it poſſeſſes when condenſed, will be, according to the ſame author's experiments, as 550,000 to 1.

11 Expanſion of the air by heat. M. Amontons, and others, we have already obſerved, attribute the rarefaction of the air wholly to the fire contained in it; and therefore by increaſing the degree of heat, the degree of rarefaction may be carried ſtill farther than its ſpontaneous dilatation. Air is expanded one-third of its bulk by boiling water.

Dr Hales found, that the air in a retort, when the bottom of the veſſel was juſt beginning to be red-hot, was expanded through twice its former ſpace; and in a white, or almoſt melting heat, it occupied thrice its former ſpace; but Mr Robins found it was expanded by the heat of iron, juſt beginning to be white, to four times its former bulk. On this principle depend the ſtructure and office of the THERMOMETER.

M. Amontons firſt diſcovered that air will expand in proportion to its denſity with the ſame degree of heat. On this foundation the ingenious author has a diſcourſe, to prove "that the ſpring and weight of the air, with a moderate degree of warmth, may enable it to produce even earthquakes, and other of the moſt vehement commotions of nature." See the article EARTHQUAKE.

12 General effects of the air's elaſticity. The elaſtic power of the air, then, is the ſecond great ſource of the effects of this important fluid. Thus it inſinuates into the pores of bodies; and, by poſſeſſing this prodigious faculty of expanding, which is ſo eaſily excited, it muſt neceſſarily put the particles of bodies into which it inſinuates itſelf into perpetual oſcillations. Indeed, the degree of heat, and the air's gravity and denſity, and conſequently its elaſticity and expanſion, never remaining the ſame for the leaſt ſpace of time, there muſt be an inceſſant vibration or dilatation and contraction in all bodies.

We obſerve this reciprocation in ſeveral inſtances, particularly in plants, the air-veſſels of which do the office of lungs; for the contained air alternately expanding and contracting, according to the increaſe or diminution of the heat, alternately preſſes the veſſels and eaſes them again, thus keeping up a perpetual motion in their juices.

Hence we find, that no vegetation or germination will proceed *in vacuo*. Indeed, beans have been obſerved to grow a little tumid therein; and this has led ſome to attribute that to vegetation which was really owing to no other cauſe than the dilatation of the air within them. The air is very inſtrumental in the production and growth of vegetables, not only by invigorating their ſeveral juices while in an elaſtic active ſtate, but alſo by greatly contributing in a fixed ſtate to the union and firm connection of their ſeveral conſtituent parts.

From the ſame cauſe it is, that the air contained in bubbles of ice, by its continual action burſts the ice. Thus alſo, entire columns of marble ſometimes cleave in the winter time, from the increaſed elaſticity of ſome little bubble of air contained in them. From the ſame principle ariſe all putrefaction and fermentation; neither of which will proceed, even in the beſt diſpoſed ſubjects, *in vacuo*.

Since we find ſuch great quantities of elaſtic air generated in the ſolution of animal and vegetable ſubſtances, a good deal muſt conſtantly ariſe from the diſſolution of theſe aliments in the ſtomach and bowels, which is much promoted by it; and, in reality, all natural corruption and alteration ſeem to depend on air.

§ 3. *Effects of the different Ingredients of Air.*—This fluid acts not only by its common properties of gravity and elaſticity, but produces numerous other effects ariſing from the peculiar ingredients of which it conſiſts.

13 Solvent power of the air on metals. Thus, 1. It not only diſſolves and attenuates bodies by its preſſure and attrition, but as a chaos containing all kinds of menſtrua, and conſequently poſſeſſing powers for diſſolving all bodies. It is known that iron and copper readily diſſolve and become ruſty in air, unleſs well defended with oil. Boerhaave aſſures us, that he has ſeen pillars of iron ſo reduced by air, that they might be crumbled to duſt between the fingers; and as for copper, it is converted by the air into a ſubſtance much like the verdigriſe produced by vinegar.

Mr Boyle relates, that in the ſouthern Engliſh colonies the great guns ruſt ſo faſt, that after lying in the air for a few years, large cakes of crocus martis may be ſeparated from them. Acoſta adds, that in Peru the air diſſolves lead, and conſiderably increaſes its weight. Yet gold is generally eſteemed indiſſoluble by air, being never found to contract ruſt, though expoſed to it ever ſo long. In the laboratories of chemiſts, however, where aqua regia is prepared, the air becoming impregnated with a quantity of the vapour of this menſtruum, gold contracts a ruſt like other bodies.

14 On ſtones. Stones alſo undergo the changes incident to metals. Thus Purbeck ſtone, of which Saliſbury cathedral conſiſts, is obſerved gradually to become ſofter, and to moulder away in the air; and Mr Boyle gives the ſame account of Blackington ſtone. He adds, that air may have a conſiderable operation on vitriol, even when a ſtrong fire could act no farther upon it. And he has found, that the fumes of a corroſive liquor work more ſuddenly and manifeſtly on a certain metal when ſuſtained in the air, than the menſtruum itſelf did, which emitted fumes on thoſe parts of the metal which it covered; referring to the effects of the effluvia of vinegar on copper.

The diſſolving power of air is increaſed by heat, and by other cauſes. It combines with water; and by acceſs of cold, depoſits part of the matter which was kept diſſolved in it by a greater degree of heat. Hence the water, by being depoſited and condenſed upon any cold body, ſuch as glaſs, &c. in windows, forms fogs, and becomes viſible.

15 Various chemical effects of the air. In the various operations of chemiſtry, air is a very neceſſary and important agent; the reſult of particular proceſſes depending on its preſence or abſence, on its being open or incloſed. Thus, the parts of animals and vegetables can only be calcined in open air; in cloſe veſſels they never become any other than black coals. And theſe operations are effected by the changes to which the air is liable. Many inſtances might be adduced to this purpoſe. Let it ſuffice to obſerve, that it is very difficult to procure oil of ſulphur, *per campanam*, in a clear dry atmoſphere; but in a thick moiſt air it may be obtained with greater eaſe, and in larger quantities. So, pure well-fermented wine, if it be carried to a place where the air is repleniſhed with

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the fumes of new wine then fermenting, will begin to ferment afresh.

The changes in the air arise from various causes, and are observable, not only in its mechanical properties, such as gravity, density, &c. but in the ingredients that compose it. Thus, as Fashlun in Sweden, noted for copper-mines, the mineral exhalations affect the air in such a manner as to discolour the silver coin in purses; and the same effluvia change the colour of brass. In Carniola, Campania, &c. where are mines of sulphur, the air becomes sometimes very unwholesome, which occasions frequent epidemic diseases, &c.

The effluvia of animals also have their effect in varying the air; as is evident in contagious diseases, plagues, murrains, and other mortalities, which are spread by an infected air.

For the vivifying principle of air, see the article Blood.

Sect. II. *Historical Account of the principal Discoveries concerning the Composition of Atmospherical Air and other Aërial Fluids.*

While the preceding discoveries were making concerning the mechanical and other properties of the air, little notice seems to have been taken of the elementary parts of the air itself, or the different kinds of fluid which go under that name. It was known, indeed, that air was separable from terrestrial bodies by means of fire, fermentation, &c. but this was commonly reckoned to be the same with what we breathe.

16 Van Helmont the first discoverer of different kinds of air.

Van Helmont, a disciple of Paracelsus, was the first who undertook to make inquiries concerning this species of air. He gave it the name of *gas sylvestre*, from the Dutch word *ghoast*, signifying spirit; and observes, that some bodies resolve themselves almost entirely into it. "Not (says he) that it had been actually contained in that form in the bodies from which it was separated; but it was contained under a concrete form, as if fixed, or coagulated." According to this author, the gas sylvestre is the same with what is separated from all substances by fermentation; from vegetables by the action of fire; from gun-powder when it explodes; and from charcoal when burning. On this occasion he asserts, that 62 pounds of charcoal contain 61 pounds of gas and only one pound of earth. To the effluvium of gas he also attributes the fatal effects of the grotto del Cani in Italy, and the suffocation of workmen in mines. He asserts, that it is to the corruption of the aliment, and the gas discharged from it, that we are to attribute wind, and the discharges of it from the bowels. Upon the same principles he accounts for the swelling of dead bodies which have remained for a time under water, and for the tumours which arise on some parts of the body in certain diseases. He also determines, that this gas is different from the air we breathe; that it has a greater affinity with water: and he imagined it might consist of water reduced to vapours, or a very subtile acid combined with volatile alkali.

17 Discoveries by Mr Boyle.

Mr Boyle repeated all Van Helmont's experiments to more advantage than he himself had performed them; but seems not to have proceeded further in his discoveries than Van Helmont did: only he found some bodies, such as sulphur, amber, camphor, &c. diminish the volume of air in which they burn.

18 By Dr Hales.

Dr Hales first attempted to determine the quantity of air produced from different bodies; for which purpose he made experiments on almost every known substance in nature, examining them by distillation fermentation, combustion, combinations, &c.

19 Suspicion of air in mineral waters.

He also first suspected, that the briskness and sparkling of the waters called *acdulous*, were owing to the air they contained. But notwithstanding all his discoveries concerning the quantity of elastic fluid obtained from different bodies, he did not imagine there was any essential difference between this fluid and the air we breathe; only that the former was loaded with noxious vapours, foreign to its nature.

20 Confirmed by M. Venel.

His suspicion concerning this impregnation was confirmed by M. Venel, professor of chemistry at Montpelier, in a memoir read before the Royal Academy of Sciences in 1750. This gentleman was able to disengage the air from the Seltzer waters, and to measure its quantity; which he constantly found to amount to about one-fifth of its bulk. The water thus deprived of its air became flat, and ceased to sparkle; the only difference then betwixt it and common water was, that the former contained a small quantity of sea-salt. Upon these principles he attempted to recompose Seltzer water, by dissolving in a pint of common water two drachms of fossile alkali, and then adding an equal quantity of marine acid. The quantity of sea-salt produced by the union of these two, he knew would prove equal to that contained in a pint of Seltzer water; and the effervescence produced by the action of the acid and alkali upon each other, he imagined, would produce air sufficient for the impregnation of the water. In this he was not deceived; the water thus produced was not only analogous to Seltzer, but much more strongly impregnated with air.

21 Discoveries by Dr Black, &c.

Dr Black first discovered, that chalk, and the other earths reducible to quicklime by calcination, consist of an alkaline earth, by itself soluble in water, but which, combined with a large quantity of fixed air, becomes insoluble; losing the properties of quicklime, and assuming the natural appearance we observe those earths to have when not reduced into lime. The same thing he discovered in magnesia alba, and in alkalis both fixed and volatile. On the fixed air contained in these bodies, he found not only their property of effervescing with acids to depend, but likewise their mildness; both the alkalis and calcareous earth being highly caustic when deprived of their fixed air. He also found, that this fluid, which he called *fixed air*, had different degrees of affinity with different substances: that it was stronger with calcareous earth than with fixed alkali; with fixed alkali, than magnesia; and with magnesia, than volatile alkali. He also suspected, that the fixed air of alkaline salts unites itself with the precipitates of metals, when thrown down from acids; and that the increase of weight observable in these precipitates was owing to this cause. But he was of opinion, that the fluid which he called *fixed air* was very different from the common air we breathe; and therefore adopted the name of air, merely as one already established, whatever impropriety there might be in the term.

It was not long before the discovery of this species of air suggested new theories in physiology and natural philosophy. Mr Haller had inferred, from Dr Hales's experiments,

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experiments, that air is the real cement of bodies; which, fixing itself in the solids and fluids, unites them to each other, and serves as a bond by which they are kept from dissolution. In 1764, Dr Macbride of Dublin published a number of experiments in support of this doctrine. From his work it appears, that fixed air is separated, not only from all substances in fermentation, but also from all animal substances as they begin to putrefy; and that this air is capable of uniting itself to all calcareous earths, as well as alkalis both fixed and volatile, and restoring to them the property of effervescing with acids when they have by any means been deprived of it. But though these opinions have since been found erroneous, the conclusions drawn by him from his numerous experiments still hold good, viz. that fixed air is an elastic fluid, very different from the common air we breathe: that it is possessed of a strong antiseptic quality, and may be introduced with safety into the intestinal canal and other parts of the animal œconomy, where common air would have fatal effects; but is mortal if breathed into the lungs, &c.

22
Quantity of fixed air contained in alkaline salts determined by Mr Cavendish.

In 1766 and 1767, Mr Cavendish communicated some new experiments to the royal Society at London, wherein he determines the quantity of air contained in fixed alkali, when fully saturated with it, to be five-twelfths of its weight, and seven-twelfths in volatile alkali: that water is capable of absorbing more than its own bulk of this air; that it has then an agreeable, spirituous, and acidulous taste; and that it has the property of dissolving calcareous earths and magnesia, as well as almost all the metals, especially iron and zinc: that the vapour of burning charcoal occasions a remarkable diminution of common air, at the same time that a considerable quantity of fixed air is produced in the operation. He also found, that solution of copper in spirit of salt, instead of producing inflammable air, like that of iron or zinc, afforded a species of air which lost its elasticity as soon as it came into contact with water.

23
Contest concerning the doctrine of fixed air.

The discoveries of Dr Black concerning fixed air had not been long published, when they were violently attacked by some foreign chemists, while his cause was as eagerly espoused by others. The principal opponents were Mr Meyer apothecary at Osnabruck, Mr Crans physician to his Russian Majesty, and Mr de Smeth at Utrecht. Their arguments, however, were effectually answered at the time by Mr Jacquin, botanical professor at Vienna; and the numerous discoveries made since that time have given such additional confirmation to his doctrine, that it is now universally adopted by chemists both in Britain and other countries.

24
Composition of the atmosphere discovered.

It was reserved, however, for Dr Priestley to make the great discovery concerning the nature of our atmosphere; and to inform the world, that it is composed of two fluids; the one absolutely noxious, and incapable of supporting animal life for a moment; the other extremely salutary, and capable of preserving animals alive and healthy for a much longer time than the purest air we can meet with. This may be considered as the ultimate period of our history: for since that time the discoveries of philosophers still living, in many different countries, have been so rapid, that it is difficult to ascertain the dates of them by any authentic documents; especially as, by reason of such numerous experiments, the same things have not unfrequently been discovered by different persons unknown to each other. We shall therefore proceed to give an account of the different kinds of aërial fluids, beginning with those which are known, or supposed, to constitute a part of our atmosphere.

Dephlogisticated Air.

Sect. III. *Of Dephlogisticated Air.*

§ 1. *Discovery and Methods of procuring this Kind of Air.*—Dephlogisticated air was first obtained by Dr Priestley on the 1st of August 1774. The circumstances which led him to the discovery, were his having always procured inflammable air from spirit of salt, by adding to it spirit of wine, oil of olives, oil of turpentine, charcoal, phosphorus, bees wax, and even sulphur. Hence he suspected, that the common air we breathe might be composed of some kind of acid united with phlogiston.

25
Whence first extracted.

On this supposition he extracted air from mercurius calcinatus *per se*, by exposing it to the focus of a burning-glass 12 inches in diameter; and, having repeated the experiment with red precipitate and minium, he found, that though a quantity of fixed air was always produced, yet after that was separated, the remainder supported flame much more vigorously than common air; for a candle burned in it with a flame very much enlarged, and with a crackling noise, at the same time that it appeared fully as much diminished by the test of nitrous air. Whence he concluded, that it was respirable; and, on making the experiment, found that it actually was so, for a mouse lived a full half hour in a quantity of this fluid; which, had it been common air, would only have kept it alive half that time. Nor did the animal seem to be otherwise injured than by the cold; as it presently revived on bringing it near the fire, and the remainder of the air still appeared better than that of the atmosphere, when the test of nitrous air was applied to it.

26
Why named dephlogisticated.

This pure kind of air being discovered, the Doctor next proceeded to name it *dephlogisticated*, from his opinion that common air, in the act of burning, absorbed phlogiston; of consequence, he supposed, that which absorbed the most, or which most vigorously and for the greatest length of time supported flame, was supposed to contain the smallest quantity of this substance. In the course of his inquiries why this kind of air comes to be so much dephlogisticated, he fell upon a method of extracting it from a great variety of substances; viz. by moistening them with spirit of nitre, and then distilling them with a strong heat.

27
Produced from a great variety of substances.

Thus he obtained it from flowers of zinc, chalk, quicklime, slacked lime, tobacco-pipe clay, flint, Muscovy talcs, and even glass. He then found, that by simply dissolving any metal in the nitrous acid, and then distilling the solution, he could obtain very pure air: and Mr Warltire found even the trouble of distillation unnecessary; nothing more being requisite than to moisten red lead with the spirit of nitre, and then pour upon it the oil of vitriol, which instantly disengaged the dephlogisticated air without applying any more heat than what was generated by the mixture.

28
This kind of air discovered also by Mr Scheele.

While discoveries of this kind engaged Dr Priestley in England, Mr Scheele was employed in a similar manner in Sweden; and had actually obtained the same kind of air, without knowing any thing of what Dr Priestley had done. The latter had the merit of the prior

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prior discovery: but Mr Scheele's method was more simple, consisting only in the distillation of nitre with a strong heat; by which means it is now found that dephlogisticated air may be obtained in very considerable quantity, and in as great purity, as by the more expensive processes. The pure air from nitre had indeed partly been obtained by Dr Hales long before this time; since he informs us, that half a cubic inch of nitre yielded 90 cubic inches of air, which was undoubtedly the fluid we speak of; but as he neglected to prosecute the discovery, nothing farther was known at that time.

29 May be produced without nitrous acid.

As the nitrous acid was universally concerned in the first processes for obtaining this kind of air, it was for some time generally believed to be a peculiar property of that acid alone to produce it; but the indefatigable genius of Dr Priestley soon found, that it might not only be procured where no nitrous acid was employed, but where the substances were treated with vitriolic acid. It was indeed evident, from the very first experiment, that nitrous acid was not essentially necessary; since pure air was procured from precipitate *per se*, in the preparation of which no nitrous acid is employed. The Abbé Fontana found, that 192 grains of this substance yielded $65\frac{1}{2}$ cubic inches of dephlogisticated air, at the same time that the weight of it was reduced to $788\frac{2}{5}$ grains, which is nearly the weight of that quantity of air. It had formerly been observed, that the weight of mercury is augmented during its conversion into precipitate *per se*, as that of lead is by its conversion into minium. The experiments just now mentioned, therefore, show, that during this process the air is decompounded; the pure dephlogisticated part of it being absorbed by the metal, and appearing again on the application of heat; and the same appears to be the case with red lead, from the experiment of Mr Warltire already mentioned. With regard to this last substance, however, a very great singularity is observed; viz. that when newly prepared it yields none at all, and even for some time after the produce is much smaller than when it has been long kept. The reason of this seems to be, that the minium still contains a considerable quantity of phlogiston, which flies off into the atmosphere by long keeping, a larger quantity of the dephlogisticated part of the atmosphere being imbibed a the same time. The mode of applying heat has also a very considerable effect on the quantity of air produced. Thus, Dr Priestley remarks *, that "from equal quantities of red lead, without any mixture of spirit of nitre, and using the same apparatus for distilling it, he obtained, by means of heat applied suddenly, more air than when slowly applied, in the proportion of ten to six. The proportion of fixed air was the same in both cases, and the remainder equally dephlogisticated."

* Exper. and Observ. ii. 27.

30 Produced in greatest quantities by a quick and violent heat.

31 Method of extracting it from various substances.

By heat alone, the Doctor found, that sedative salt, manganese, lapis calaminaris, and the mineral called *Lapis ponderosus, wolfram*, or *tungsten*, would yield dephlogisticated air; the first indeed in very small quantity, and sometimes even of a quality very little superior to common air. In these experiments, he made use of small-bellied retorts of green glass, which can stand the fire best, containing about an ounce of water, and having narrow necks 18 or 20 inches long. The substance to be examined was put into a retort of this kind, and then exposed to a red heat, either in sand or over a naked fire, while the neck of the vessel was plunged in water or mercury.

Having dissolved six pennyweights of very clean iron in oil of vitriol, and then distilled the solution to dryness in a long-necked retort, he received the common air a little phlogisticated, some fixed air, much vitriolic acid air, and lastly 18 ounce measures of dephlogisticated air. The iron that remained undissolved weighed 23 grains, so that the air was yielded by five pennyweights one grain of iron. The ochre weighed seven pennyweights thirteen grains: so that, says he, there probably remained a quantity of oil of vitriol in it; and consequently, had the heat been greater, more air would have been obtained.

In his experiments with the nitrous acid, as it had constantly been found, that by pouring on more nitrous acid on the residuum, and repeating the operation, more dephlogisticated air might be obtained, the Doctor determined to try whether the same would not hold good with vitriolic acid also. For this purpose, he added more oil of vitriol to the residuum of the last-mentioned experiment. When in a red heat with a glass retort, it yielded a quantity of vitriolic acid air, no fixed air, but about 24 ounce measures of dephlogisticated air: when, the retort being melted, a good deal of the air was necessarily lost; but, on resuming the process in a gun-barrel, he procured as much air as had been got before.—Pursuing these experiments, he obtained with common crust of iron and oil of vitriol, dephlogisticated air at the first distillation, and a great deal more from the residuum, by pouring fresh oil of vitriol upon it. The same product he obtained from blue vitriol, solution of copper in the vitriolic acid, and from a solution of mercury in that acid. On this substance he remarks, that "either by means of oil of vitriol or spirit of nitre, it yields a great quantity of dephlogisticated air: but with this difference, that in the process with spirit of nitre, almost the whole of the mercury is revived (not more than a twentieth part being lost, if the process be conducted with care); but in that with vitriolic acid, almost the whole is lost." From the later experiments of Mr Lavoisier, however, it appears that the Doctor's process had not been conducted with sufficient care; as from two ounces of the dry salt formed by a combination of vitriolic acid with mercury, the former obtained 6 drachms 12 grains of running mercury, besides 3 drachms 58 grains of mercurial sublimate of two different colours. Dephlogisticated air was likewise obtained from pure calx of tin, or putty, mixed with oil of vitriol; but none in any trial with the marine acid, excepting when it was mixed with minium; in which case the air obtained was probably that which the minium would have yielded without any addition.

32 How dephlogisticated air is naturally produced.

The result of all these, and innumerable other experiments made by philosophers in different countries, was, that dephlogisticated air may be obtained from a vast variety of mineral and metallic substances by means of the vitriolic and nitrous acids. It now remained only to discover in what manner this fluid, so essentially necessary to the support of animal life, is naturally produced in quantities sufficient for the great expence of it throughout the whole world, by the breathing of animals, the support of fires, &c. This discovery, indeed, Dephlogisticated Air. deed, had been made before even the existence of dephlogisticated air itself was known. Dr Priestley, after having tried various methods of purifying contaminated air unsuccessfully, found at last, that some kinds of vegetables answered this purpose very effectually; for which discovery he received the thanks of the Royal Society. Among the vegetables employed on this occasion, he found mint answer the purpose very effectually. "When air," says he*, "has been freshly and strongly tainted with putrefaction, so as to smell through the water, sprigs of mint have presently died upon being put into it, their leaves turning black; but if they do not die presently, they thrive in a most surprising manner. In no other circumstances have I seen vegetation so vigorous as in this kind of air, which is immediately fatal to animal life. Though these plants have been crowded in jars filled with this kind of air, every leaf has been full of life; fresh shoots have branched out in various directions, and grown much faster than other similar plants growing in the same exposure in common air."—Having in consequence of this observation rendered a quantity of air thoroughly noxious, by mice breathing and dying in it, he divided it into two receivers inverted in water, introducing a sprig of mint into one of them, and keeping the other receiver unaltered. About eight or nine days after, he found that the air of the receiver into which he had introduced the sprig had become respirable; for a mouse lived very well in this, whereas it died the moment it was put into the other.

* Exper. and Observ. vol i. p. 1. sect. 4.

33 Noxious air improved by vegetating mint.

34 Experiments seemingly contradictory.

From these experiments the Doctor at first concluded, that in all cases the air was meliorated by the vegetation of plants: but even in his first volume he observes, that some experiments of this kind did not answer so well towards the end of the year as they had done in the hot season; and a second course seemed to be almost entirely contrary to the former. Having tried the power of several sorts of vegetables upon air infected by respiration or by the burning of candles, he found that it was generally rendered worse by their vegetation; and the longer the plants were kept in the infected air, the more they phlogisticated it; though in several cases it was undoubtedly meliorated, especially by the shoots of strawberries and some other plants, introduced into the vials containing foul air, and inverted in water, which were placed near them, whilst their roots continued in the earth in the garden. Sometimes the infected air was so far mended by the vegetation of plants, that it was in a great measure turned into dephlogisticated air. "On the whole,*" says Dr Priestley, "I still think it probable, that the vegetation of healthy plants, growing in situations natural to them, have a salutary effect on the air in which they grow.—For one instance of the melioration of air in these circumstances should weigh against an hundred in which the air is made worse by it, both on account of the disadvantages under which all plants labour, in the circumstances in which these experiments must be made, as well as the great attention and many precautions that are requisite in conducting such a process."

* Exper. and Observ. iv.

35 Experiments of Dr Ingenhousz on the melioration of air by vegetation.

At the time that Dr Priestley made these experiments, he supposed that the air was meliorated merely by the absorption of phlogiston from that which had been tainted; but the experiments of Dr Ingenhousz, made in 1779, showed that this was accomplished, not only by the absorption just mentioned, but by the emission of dephlogisticated air. He observed in general, that plants have power of correcting bad air, and even of improving common air in a few hours, when exposed to the light of the sun; but, in the night-time, or when they are not influenced by the solar rays, they contaminate the air. This property, however, does not belong in an equal degree to all kinds of plants: nor is it possible to discover by the external properties of a plant, whether it be fit for this purpose or not; as some which have a bad smell, and are entirely unfit for food, show themselves much superior to others whose external appearance would seem preferable. His method of making the experiment was, to fill a vial with air, fouled either by respiration or combustion; after which a sprig of any plant was introduced, by passing it through the water in which the vial was immersed. The vial was then stopped; or it was removed into a small bason full of water, and exposed to the sun, or situated in some other proper place as occasion required. Air phlogisticated by breathing, and in which a candle could not burn, after being exposed to the sun for three hours, with a sprig of peppermint in it, was so far corrected, as to be again capable of supporting flame.—The following experiment, however, made with a mustard plant, may be looked upon as decisive: A plant of this kind was put into a glass receiver containing common air, and its stem cut off even with the mouth of the receiver. The vessel was then inverted in an earthen pan, containing some water to keep the plant alive, and the whole apparatus was set over-night in a room. Next morning the air was found so much contaminated, that it extinguished the flame of a wax taper. On exposing the apparatus to the sun for a quarter of an hour, the air was found to be somewhat corrected; and after an hour and an half it was so far improved, that by the test of nitrous air it appeared considerably better than common air.

36 Dephlogisticated air produced from water.

Before we proceed farther in the account of Dr Ingenhousz's experiments, it will be necessary to relate some observations made by Dr Priestley; from which it appears, that dephlogisticated air, in very considerable quantity, may, in certain circumstances, be procured from water alone. The substance of these is, that water, especially pump-water, when exposed to the light of the sun, emits air slowly: but after some time a green matter appears on the bottom and sides of the glass; after which it emits very pure air in great quantity, and continues to do so for a very long time, even after the green matter has shown some symptoms of decay by becoming yellow. He observed, that the water which naturally contained the greatest quantity of fixed air, yielded also the greatest quantity of that which was dephlogisticated; but that the quantity of the latter much exceeded that of the fixed air contained even in any water. The light of the sun was found to be an essential requisite in the formation of this air, as very little, and that of a much worse quality, was produced in the dark.

37 From the leaves of plants.

As the green matter produced in Dr Priestley's glasses, was by himself, as well as others, considered as belonging to the vegetable kingdom, Dr Ingenhousz improved upon his process, by putting the leaves of plants into water, and exposing them to the sun. All plants were not equally fit for producing dephlogisticated air

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by this method more than by the other. Some poisonous plants, as the hyoscyamus, lauro-cerasus, night-shade, the tobacco-plant, a triplex vulvaria, cicuta aquatica, and sabina, were found very fit for the purpose; but the purest kind of air was extracted from some aquatic vegetables, the turpentine-trees, and especially from the green matter he collected in a stone trough which was kept continually filled with water from the spring near the high-road. The purity of this dephlogisticated air, he says, was equal, if not superior, to that procured by the best chemical processes; as it sometimes required eight times its own quantity of nitrous air to saturate it. All parts of the plants were not found equally proper for the production of dephlogisticated air; the full grown leaves yield it in greatest quantity and purity, especially from their under surface. It was also procured from the green stalks.—One hundred leaves of *Nasturtium Indicum*, put into a jar holding a gallon, filled with ordinary pump-water, and exposed to the sun from 10 to 12 o'clock, yielded as much air as filled a cylindrical jar four inches and an half in length, and one and three quarters in breadth.—On removing this quantity of air, and exposing them again to the sun till seven o'clock, about half as much was produced, of a quality still superior to the former; and next morning by eleven o'clock, they yielded as much more of an equal quality. The roots of the plants, he says, when kept out of ground, generally yield bad air, and at all times contaminate common air, a few only excepted. Flowers and fruits, in general, yield a very small quantity of noxious air, and contaminate a great quantity of common air at all times, especially in the night, and when kept in the dark. Two dozen of young and small French beans, kept in a quart-jar of common air for a single night, contaminated the air to such a degree, that a very lively chicken died by being confined in it less than half a minute.

38 Conclusions from Dr Ingenhousz's experiments.

The observations of Dr Ingenhousz on the whole, says Mr Cavallo, clearly show, "that the vegetation of plants is one of the great means employed by nature to purify the atmosphere, so as to counteract, in great measure, the damage done by animal respiration, combustion, &c. It may only be said, that vegetation does not appear to be sufficient to remedy entirely that damage." The Doctor himself, however, speaks very highly of the powers of vegetables in this respect. He informs us, that their office in yielding dephlogisticated air begins a few hours after the sun has made his appearance in the horizon, or rather after it has passed the meridian, and ceases with the close of the day; excepting some plants which continue it a short time after sunset: The quantity of dephlogisticated air, yielded by plants in general, is greater in a clear day than when it is somewhat cloudy. It is also greater when the plants are more exposed to the sun, than when they are situated in shady places. He observes, moreover, that the damage done by plants in the night, is more than counterbalanced by the benefit they afford in the day-time.—"By a rough calculation, (says he), I found the poisonous air, yielded by any plant during the whole night, could not amount to one hundredth part of the dephlogisticated air which the same plant yielded in two hours time in a fair day."—It does not appear, however, that plants yield dephlogisticated air by any kind of generation of that fluid, but only by filtrating the common air, which all plants absorb through their pores; the phlogistic part becoming part of their substance, and probably being the true vegetable food, as is explained more at large under the article AGRICULTURE.—Dry plants have little or no effect upon the air until they were moistened.—On all these experiments, however, it must be observed, that they have sometimes failed in the hands of those whom we cannot but suppose very capable of trying them; as Mr Scheele, Mr Cavallo, and the Abbé Fontana.

39 Sir Benjamin Thomson's experiments.

After the publication of Dr Ingenhousz's experiments, it became generally believed, that the atmosphere was meliorated by the common process of vegetation, and that plants absorbed the phlogistic part as their food, discharging the pure dephlogisticated air as an excrement; which is just the reverse of what happens to animals, who absorb the pure part in respiration, and reject the phlogistic. In the Philosophical Transactions for 1787, however, we find a number of experiments related by Sir Benjamin Thompson, which seem to render this matter dubious.—One very considerable objection is, that the green matter, already mentioned in Dr Priestley's experiments, when carefully observed by a good microscope, appears not to be of a vegetable, but of an animal nature. The colouring matter of the water, says he, is evidently of an animal nature; being nothing more than the assemblage of an infinite number of very small, active, oval-formed animalcules, without any thing resembling *tremella*, or that kind of green matter or water-moss which forms upon the bottom and sides of the vessel when this water is suffered to remain on it for a considerable time, and into which Dr Ingenhousz supposes the animalcules above mentioned to be actually transformed.

40 Green matter observed by D Prestley, said to be of an animal nature.

This gentleman has also found, that several animal substances, as well as vegetables, have a power of separating dephlogisticated air from water when exposed to the light of the sun, and that for a very great length of time. Not that the same quantity of water will always continue to furnish air; but the same animal substance being taken out, washed, and again put into fresh water, seems to yield dephlogisticated air, without any kind of limitation.

41 Dephlogisticated air produced by raw silk.

Raw silk possesses a remarkable power of this kind. To determine it, Sir Benjamin introduced 30 grains of this substance, previously washed in water, into a thin glass globe $4\frac{1}{2}$ inches in diameter, having a cylindrical neck $\frac{3}{4}$ths of an inch wide, and twelve inches long, inverting the globe into a jar filled with the same kind of water, and exposing it to the action of the sun in the window. It had not been ten minutes in this situation, when the silk became covered with an infinite number of air-bubbles, gradually increasing in size, till, at the end of two hours, the silk was buoyed up, by their means, to the top of the water. By degrees they began to separate themselves, and form a collection of air in the upper part of the globe; which, when examined by the test of nitrous air, appeared to be very pure. In three days he had collected $3\frac{3}{4}$ cubic inches of air; into which a wax-taper being introduced, that had just been before blown out, the wick only remaining red, it instantly took fire, and burned with a bright and enlarged flame. The water in the globe appeared to have lost something of its transparency, and had changed its colour to a very faint greenish cast, having at

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at the same time acquired the smell of raw silk—This was several times repeated with fresh water, retaining the same silk, and always with a smaller result; but with this difference, that when the sun shone very bright, the quantity of air produced was not only greater, but its quality superior to that yielded when the sun's rays were feeble, or when they were frequently intercepted by flying clouds. "The air, however, (says he), was always not only much better than common air, but even than that produced by the fresh leaves of plants exposed in water to the sun's rays in the experiments of Dr Ingenhousz; and, under the most favourable circumstances, it was so good, that one measure of it required four of nitrous air to saturate it, and the whole five measures were reduced to 1.35."

42 No air produced in the dark.

An experiment was next made in order to determine the effect of darkness upon the production of air: and in this case only a few inconsiderable bubbles were formed, which remained attached to the silk; nor was the case altered by removing the globe into a German stove. Some single bubbles, indeed, had detached themselves from the silk and ascended to the top, but the air was in too little quantity to be measured or proved.—The medium heat of the globe, when exposed to the sun's rays, was about 90° of Fahrenheit, though sometimes it would rise as high as 96; but air was frequently produced, when the heat did not exceed 65 and 70°.—

43 Effects of light without heat.

On reversing this experiment, in order to try the effect of light without heat, it was found, that by plunging the globe into a mixture of ice and water, which brought it to the temperature of about 50° of Fahrenheit, the produce of air was diminished, though it still continued in considerable quantity.

44 Of artificial light.

The effect of artificial light, instead of that of the sun, was next tried. For this purpose all the air was removed from the globe; and its place being supplied with a quantity of fresh water, so as to render it quite full, it was again inverted in the jar, and removed into a dark room surrounded with six lamps and reflectors; six wax candles were also placed at different distances from three to six inches from it, and disposed in such a manner as to throw the greatest quantity of light possible upon the silk, taking care at the same time that the water should not acquire a greater heat than 90°. In this situation the silk began to be covered with air-bubbles in about ten minutes; and in six hours as much was collected as could be proved by nitrous air, when it was found to be very pure. A fresh-gathered, healthy leaf of a peach-tree, and a stem of the pea-plant with three leaves upon it, furnished air by exposure to the same light, but in smaller quantities than by the action of the solar rays. The air produced in the dark, in whatever manner procured, was always in too small a quantity to be measured.

In making these experiments, as it was found somewhat troublesome to invert the globes in water, they were at last only kept in an inclined posture on the table, as represented in Pl. X. fig. 1. the air collecting itself in the upper part of the belly. Having provided himself with a number of globes of different sizes, he then proceeded in his experiments in the following manner.

45 Various substances substituted for raw silk.

Finding that raw silk, exposed to the action of light, produced so great a quantity of air, he was induced to try whether some other substances might not be found out capable of doing the same. Having therefore provided six globes of $4\frac{1}{2}$ inches in diameter, and filled them with spring water, he introduced into each of them 15 grains of one of the following substances, *viz.* sheep's wool, cider-down, fur of a Russian hare, cotton wool, lint or the ravelings of linen yarn, and human hair.—The results of these experiments were, 1. The globe containing the sheep's wool began to yield air in three days; but several days of cloudy weather intervening, he did not remove it for some time, when only $1\frac{3}{4}$ths of an inch of air was collected, which proved very pure when tried with nitrous air; but the wool, even in the most favourable circumstances, never afforded more than one third of the quantity which would have been yielded by silk. 2. The water with the eider-down began to furnish air almost immediately, and continued to do so in quantities little less than had been furnished by the silk, and nearly of the same quality. One cubic inch and three quarters of this air, furnished the eighth day from the beginning of the experiment, with three measures of nitrous air, was reduced to 1.34. 3. The fur of the hare produced more air than the wool, but less than the eider-down. Two cubic inches of air were collected in four days; which made its appearance in a different manner from that of the other substances, the air-bubbles being at considerable distances from one another, and growing to an uncommon size before they detached themselves from the fur. The cotton yielded a considerable quantity of air of a better quality than any of the former. The ravelings of linen were very slow in furnishing air, and produced but a small quantity; only two cubic inches being collected in the space of a fortnight. This substance appeared to be the very reverse of the hare's fur; for the air, instead of attaching and collecting itself about the substance in large bubbles, scarce ever made its appearance in sufficient quantity to raise it to the top of the water. The human hair furnished still less than the linen, and the produce was of inferior quality, though still superior to the common atmosphere.

In order to discover the comparative fineness of air produced from vegetables and from raw silk, a small quantity of air from the stem of a pea-plant, which had four healthy leaves upon it, was proved with nitrous air, and found greatly inferior to that from raw silk and several of the substances already mentioned. An entire plant of housewort, of a moderate size, furnished only $\frac{3}{4}$ths of a cubic inch of air in seven hours, and that greatly inferior to common air; but the leaves alone afforded a much greater quantity, and of a quality greatly superior.

46 Of the quantity of air procured by means of these substances from water.

Having proceeded thus far, it was next determined to ascertain how much air a given quantity of water would yield by exposure to the sun's rays. For this purpose, a globe of fine white, clear, and very thin glass, containing 296 inches, being filled with fresh spring water, and 30 grains of raw silk immersed in it, was exposed to the air for three days in the month of May, but for the most part cold and cloudy. During this time only $9\frac{1}{2}$ inches of air were produced; but next day, by exposure to the sun from nine in the morning till five in the afternoon, the weather being very fine, 8.46 inches more were produced. The water had now assumed a light greenish colour. Next day, the product of air was nine cubic inches, of a better quality; and the day following, six inches still superior,

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superior, though exposed only for three hours and an half; but the next day, it being cold and cloudy, only [illegible]ths of an inch of air were produced, and these manifestly inferior to the foregoing. No more air could afterwards be procured, excepting one quarter of a cubic inch; so that from 296 inches of this water, 35.96 of air were obtained.

In this experiment the air produced was every day removed from the globe, and its place supplied with water: the following were made, to determine what alteration would take place on allowing the quantity of air produced to remain from first to last. The globe being therefore filled again, and the silk well washed and replaced in it, the quantity of air produced amounted in four days to 30.1 cubic inches; and would probably have been more considerable, had not the globe been unable to contain it along with the water, and therefore there was a necessity for putting an end to the experiment. The quality was superior to the former.—In this experiment the water had lost its transparency, and acquired a greenish cast; a quantity of yellowish earth was precipitated to the bottom, and attached itself so strongly to the glass, that it could not be removed without great difficulty.

On varying the experiment, by employing unwashed raw silk, it was found, that 17 grains of it in 20 cubic inches of water, produced, for the first 4 days, air of a worse quality than the atmosphere; but afterwards yielded near two inches of a superior quality. The quantity of this air was superior to that in other experiments, though its quality was somewhat inferior.

In reflecting on the experiments above related, it occurred to Sir Benjamin, that the cotton-like substance produced by the *populus nigra*, a species of poplar tree, might be a proper substitute for the raw silk; especially as he recollected, that on rendering it very dry for some other purpose, some parcels of it had quitted the plate on which they were laid, and mounted up to the top of the room. An hundred and twenty grains of this substance were therefore put into the large globe containing 296 inches; but after exposure to the sun for some hours, the air produced, in quantity about $1\frac{3}{4}$ths of a cubic inch, was found to be little better than phlogisticated air. In three days after, only one cubic inch was formed; and this appeared to be completely phlogisticated. Next day, only a few inconsiderable air-bubbles appeared; but, the day following, the water suddenly changed to a greenish colour, and began all at once to give good air, and in great abundance. This day 10.42 cubic inches were produced, and the next 14.34. The same water continued to furnish air for four days longer; the whole quantity amounting to $44\frac{1}{4}$ cubic inches, the quality of which was superior to that of the air produced in former experiments.

47 Of the cause of this production of air.

In speculating on the cause of this production of air, it occurred to our author, that perhaps the quantity of it might be in proportion to the surfaces of both. In order to ascertain this, he viewed an hair of silk, and another of poplar-cotton, through a good microscope, when the former appeared twice the diameter of the latter. The specific gravity of the cotton was found to be nearly equivalent to that of water; and, by a comparative view of the two through a microscope, the surfaces appeared to be as 1000 to 3468. By proceeding in this calculation, it appeared that the surface of 30 grains of the cotton could not be less than 6600 square inches, while that of a like quantity of the silk amounted to no more than 476. Hence it evidently appeared, that the produce of air from the two substances was neither in proportion to their weights nor their surfaces. It appeared also, that the quality of the air produced at first was considerably inferior to that yielded sometime afterwards. In order to ascertain the times at which air of the best quality was produced, &c. the following experiments were made: 1. A globe, containing 46 cubic inches, being filled with water, and 30 grains of raw silk, well washed, and freed from the remains of former experiments, put into it, yielded in a cold and cloudy day only $\frac{1}{7}$th of a cubic inch of air: the two following days it yielded $3\frac{1}{2}$ cubic inches, the quality of which was superior to that of the former in the proportion of 296 to 114 (A). 2. The globe filled again with water, in two other days when the sunshine was less powerful, the quality was 197, and the quantity $1\frac{1}{8}$th; but afterwards, when the weather became fine, the quantity was again 3.8 inches, and quality 342. 3. The globe being again filled with water, and exposed to the sun for two days, yielded 2.2 inches of air, of a quality equal to 233. 4. A similar globe, with poplar-cotton which had been used in former experiments, gave 2.53 inches, of a quality 280. 5. A small globe of 20 inches, with 17 grains of raw silk, gave one cubic inch of air, of the quality 263. 6. A large globe of 296 inches, filled with fresh water, and a small quantity of *conferva rivularis*, gave $1\frac{1}{2}$ cubic inch, of the quality only of 124. The water was changed to a brown colour. 7. On repeating the experiment with a small handful of the conferva, 13.14 cubic inches of air were produced, of the quality 246. The water was very faintly tinged, towards the end of the experiment, of a greenish cast. 8. The globe of 46 inches, with 30 grains of raw silk used in many former experiments, produced in two days 1.6 cubic inches of air, of the quality of 204. 9. A globe of equal capacity, with 15 grains of poplar-cotton, produced in the same time 1.28 inches, of the quality 260. In both these experiments, the water had acquired a faint greenish cast; but the colour of that with the cotton was deepest. On examining this water with a microscope, it was found to contain a great number of animalcules exceedingly small, and nearly of an oval figure; that with the silk contained them likewise, but not in such numbers: however, our author assures us, that in all cases in which the water acquired a greenish hue, he never failed to find them; and thinks, that from their presence alone, the colour of the water in the first instance universally arose.

48 At what times air of the best quality is produced.

49 Experiment with spun glass.

As Sir Benjamin was now more than ever embarrassed with respect to the share the silk and other bodies employed in these experiments had in producing the air, he made the following experiment to determine the matter: "Concluding (says he), that if silk and other bodies,

(A) In all these experiments, the quality of the atmospheric air is supposed to be 100.

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bodies, used in the foregoing experiments, actually did not contribute any thing, considered as chemical substances, in the process of the production of pure air yielded by water; but if, on the contrary, they acted merely as a mechanical aid in its *separation* from the water, by affording them a convenient surface for air to attach itself to; in this case, any other body having a large surface, and attracting air in water, might be made use of instead of the silk in the experiment, and pure air should be furnished, though the body should be totally incapable of communicating any thing whatever to the water."

With a view to ascertain this, the large globe being made perfectly clean, and filled with spring-water, he introduced into it a quantity of the fine thread of glass commonly called *spun glass*, such as is used for making a brush for cleaning jewels, and an artificial feather sold by Jew pedlars. The result of the experiment was, that the globe being exposed to the sun, air-bubbles began almost instantly to make their appearance on the surface, and in four hours 0.77 of a cubic inch of air was produced, which, with nitrous air, showed a quality of 88; after which, not a single globule more was procured, though the globe was exposed for a whole week in fine sunshine weather. Hence it appears, that something more than mere surface was wanted to produce dephlogisticated air from water by means of the sun's light.

50 Of the quantity and quality of air produced from water alone.

The following experiments were made with a view to determine the quantity and quality of air produced by means of the heat and light of the sun from water alone. A large jar of clear glass, containing 455 cubic inches, being washed very clean, was filled with fresh spring water, inverted in a glass bason of the same, and exposed to the weather for 28 days. At the same time, another similar jar was filled with water taken from a pond in a garden in which many aquatic plants were growing, and exposed in the same place, and during the same period. The latter began to yield air in pretty large quantities on the third day, and continued to do so till the 14th; the former yielded little or none till the 14th; when it began to emit air, and continued to do so till the 22d. On removing the air produced, that from the spring-water was 14 inches in quantity, and 138 in quality; but from the pond water, 31½ in quantity, and 252 in quality. The colour of the water was not changed; but both of them had deposited a considerable quantity of earth, which was found adhering to the surfaces of the glass basons in which the jars were inverted. As these basons, however, were very thick, and consequently had but little transparency, the sediment of the water was in a great measure deprived of the benefit of the sun's light; the experiment was therefore repeated with the following variation: In a large cylindrical jar of very fine transparent glass, 10 inches in diameter and 12 inches high, filled with spring-water, a conical jar, 9¾ inches in diameter at the bottom, and containing 244 inches, was inverted, and the whole exposed to the sun for 21 days. Little air was furnished till the 7th day, when the liquor assumed a greenish cast, and a fine slimy sediment of the same colour, the green matter of Dr Priestley, beginning to be formed on the bottom, air was generated in abundance, and was furnished in pretty large quantities till the 18th, when it entirely ceased. The whole amounted to 40 cubic inches, and the quality 213.

51 Dr Ingenhousz's theory contested.

These are the principal experiments contained in Sir Benjamin Thompson's letter to Sir Joseph Banks. In his postscript he observes, that as he never was thoroughly satisfied with the opinion of Dr Ingenhousz, that the dephlogisticated air was *elaborated* in the vessels of the plant, he found his doubts rather confirmed than diminished by the experiments above related. 'That the fresh leaves of certain vegetables (says he) exposed in water to the action of the sun's rays, cause a certain quantity of pure air to be produced, is a fact which has been put beyond all doubt: but it does not appear to me by any means so clearly proved, that this air is '*elaborated* in the plant by the powers of vegetation,—phlogisticated or fixed air being received by the plant as food, and the dephlogisticated air rejected as an excrement:' for besides that many other substances, and in which no elaboration or circulation can possibly be supposed to take place, cause the water in which they are exposed to the action of the light to yield dephlogisticated air as well as plants, and even in much greater quantities, and of a more eminent quality; the circumstances of the leaves of a vegetable, which, accustomed to grow in air, are separated from its stem and confined in water, are so unnatural, that I cannot conceive that they can perform the same functions in such different situations.

"Among many facts which have been brought in support of the received opinion of the elaboration of air in the vessels of plants, there is one upon which great stress is laid, which, I think, requires further examination. The fresh healthy leaves of vegetables, separated from the plant, and exposed in water to the action of the sun's rays, appear, by all the experiments which have hitherto been made, to furnish air only for a short time. After a day or two, the leaves, changing colour, cease to yield air. This has been conceived to arise from the powers of vegetation being destroyed, or, in other words, the death of the plant: and from hence it has been inferred, with some degree of plausibility, not only that the leaves actually retained their vegetative powers for some time after they were separated from their stalk; but that it was in consequence of the exertion of those powers, that the air yielded in the experiment was produced.

52 Leaves of plants resume their property of emitting air, after seeming to have lost it.

"But I have found, that although the leaves, exposed in water to the action of light, actually do cease to furnish air after a certain time, yet that they *regain* this power after a short interval, when they furnish (or rather cause the water to furnish) more and better air than at first; which can hardly be accounted for upon the supposition that the air is elaborated in the vessels of the plant."

In confirmation of this doctrine, the globe of 46 inches was filled with fresh spring water, and two peach-leaves were exposed for 10 days to the sun. In four days the water seemed to be entirely exhausted; but, next day, the water acquired a greenish colour, and again produced air pretty plentifully, which appeared in bubbles on the leaves; and on the 6th day, 0.34 of a cubic inch of air was produced, of the quality 232. Next day it yielded $\frac{9}{10}$ths of a cubic inch, of the quality 291. The three succeeding days it yielded 1½ inches, the quality 307; after which an end was put to the experiment.—

Dephlogisticated Air. riment.—On making other trials with leaves immersed in water already green and prepared to yield dephlogisticated air, it was found that they produced air in great quantity: but our author is of opinion, that all the appearances may be solved, by supposing that the air was produced in the mass of water by the green matter; and that the leaves, silk, &c. did no more than assist it in making its escape, by affording a convenient surface to which it could attach itself, in order to collect together and assume its elastic form.

Thus we see, that nature is provided with abundant resources for the supplying of this pure part of the atmosphere which is subject to such continual waste; and there is not the least doubt, that in a great number of cases the light of the sun produces pure air from water as well as from vegetables. It is probable, also, that even the waters of the ocean contribute towards this salutary purpose; as Dr Dobson of Liverpool found, that sea-water contained air superior in quality to that of the atmosphere. The purification of atmospherical air by agitating it in water, will be considered in a subsequent section.

53 Pure air found in sea-water.

54 How to procure pure air in large quantity.

As dephlogisticated air is found to support animal life for a much longer time than common air, it has been supposed that it might answer valuable purposes in medicine, provided any cheap method of procuring it in large quantities could be fallen upon. With this view, Mr Cavallo proposes to distil it from nitre with a strong heat; but the experiments already related certainly point out an easier method, free from the expence and trouble which must necessarily attend every chemical operation of this kind.

§ 2. *Properties of Dephlogisticated Air.*—This kind of air possesses some of the properties of common air in a very eminent degree, but is deficient in others. Those in which it excels, are the support of flame and of animal life. It is equally elastic, or rather more so, than common air; as it likewise exceeds it a little in specific gravity, the proportion betwixt it and common air being that of 160 to 152. On introducing a lighted candle into dephlogisticated air, the flame not only grows larger, but becomes exceedingly bright; and when the air is very pure, the candle burns with a crackling noise, as if the air contained some combustible matter, at the same time that the wax or tallow wastes surprisingly fast.

55 Dephlogisticated air produces intense heat.

The heat of the flame is in proportion to its light. If we fill a bladder with dephlogisticated air, and then fasten to its neck a glass tube whose aperture is drawn to a fine point, the dephlogicated air, if driven out by pressing the bladder, will augment the heat of a candle to such a degree, that if any small bits of metal, placed on a piece of charcoal, be held in the apex of the flame, they will almost instanly be melted. Even grains of platina may by this means be melted; and in a larger fire there is no doubt that the effects of burning mirrors might be equalled.

56 Explodes with inflammable air.

On mixing dephlogisticated and inflammable air, together, an explosion takes place as on mixing common and inflammable air, but with much greater violence. If an ounce vial, which for this purpose should be very strong, be filled with a little more than one-third of dephlogisticated and the rest inflammable air, and the flame of a candle presented to its mouth, it will explode nearly as loud as a small pistol.

All phlogistic processes are promoted much better by dephlogisticated than common air. Dr Priestley put a quantity of pyrophorus into one of the small jars used for making experiments upon air in quicksilver; then filling up the vessel with that fluid, he inverted it in a bason of the same, and threw in dephlogisticated air at different times. It always occasioned a sudden and vehement accension, like the flashing of gun-powder, and the air was greatly diminished.

57 Burns vehemently with pyrophorus.

58 Common air is not diminished by burning

It has been, almost throughout all ages, believed, that combustion in every instance diminished common air, or reduced it to a smaller volume: but the late experiments of Mr Lavoisier have shown, that this is a mistake; and that in ordinary processes attended with the production of fixed and phlogisticated air, the quantity of vapour produced is equivalent to that absorbed, or otherwise made to disappear during the operation. With dephlogisticated air the case is very different. Mr Lavoisier having introduced a burning candle into a glass jar filled with very pure air obtained from calcinated mercury, a great heat took place; which at first expelled a small quantity of the air; but afterwards, when the candle was extinguished, it was found that two-thirds of the bulk of air employed had been converted into fixed air, or a quantity of this kind of air equivalent to the former had been produced. The remainder, after taking up the fixed air by caustic alkali, was still as pure as before. In the common processes, he observes, that not more than one-tenth of the air employed is converted into fixed air. In this experiment, the superior gravity of fixed air, and the consequent condensation of the other, must undoubtedly have produced some diminution in the volume of air, though Mr Lavoisier does not take notice of it. In other cases, however, the diminution is much more perceptible. Mr Scheele having introduced some live coals into a matrass filled with dephlogisticated air, found that it was diminished by one-fourth of its quantity. Repeating the experiment with sulphur, the flame became larger and more vivid than in common air, and three-fourths of its quantity were lost. Putting a piece of phosphorus into seven ounce-measures of this kind of air, stopping the mouth of the bottle with a cork, and setting fire to the phosphorus within it, the phial broke to pieces, as soon as the flame was extinguished, by the pressure of the external air. Repeating the experiment with a stronger vial, and opening it afterwards under water, the fluid rushed into it in such a manner as almost to fill it entirely. This extraordinary diminution was also perceived on setting fire to inflammable air in the dephlogisticated kind. The way in which he accomplished this was, by filling a matrass with dephlogisticated air, and inverting it over a phial containing an effervescing mixture of vitriolic acid and iron-filings plunged into a vessel of hot water, and furnished with a slender tube reaching above the surface of the vessel, as represented Plate X. fig. 2. The inflammable air issuing from the orifice of the small tube, was set on fire previous to the inversion of the mattrass, and the mouth of the latter immersed in the water; on which that fluid soon began to rise, and continued to do so till seven-eighths of the vessel were full. In cases of slow combustion, where common air is diminished and phlogisticated, the dephlogisticated kind was found to be almost entirely

59 But dephlogisticated air suffers diminution

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tirely destroyed. A phial, containing 20 ounce measures of dephlogisticated air, and inverted into a solution of hepar sulphuris, was entirely filled with the latter in the space of two days.

60 Phenomena of dephlogisticated with nitrous air.

The purity of dephlogisticated air is ascertained by its degree of diminution with nitrous air; which, like that of the diminution by liver of sulphur, or otherwise, is to be considered as a phlogistic process, or kind of burning, especially as a considerable degree of heat is thereby generated. Very great differences are perceived in this respect; and according to the quantity of diminution, the air is said to be two, three, or four times better than common air. It is not yet accurately determined how far this proportionable purity extends. Dr Priestley mentions some extracted from red lead five times as pure as common air. Another quantity, produced from a solution of mercury in nitrous acid, was so pure, that one measure of it mixed with two of nitrous air, which had been obtained in the first part of the same process, occupied only 0.03 of a measure. "Repeating the experiment (says he), I found, that two measures of nitrous air were rather more than sufficient to saturate one measure of the dephlogisticated air; so that possibly, had the former experiment been made with more circumspection, the diminution, extraordinary as it was, would have been somewhat greater. Indeed it cannot be supposed, that exactly two measures of nitrous air should be the precise quantity that would afford the greatest diminution. It should also be considered, that a small portion of air might be yielded by the water in which the experiments were made. Upon the whole, therefore, I am inclined to think, that, were it possible to make both the dephlogisticated and nitrous air in the greatest purity, and then to mix them in some exact proportion, the aërial form of them both would be destroyed, the whole quantity seeming to disappear, as in the mixture of alkaline and acid air."

61 How dephlogisticated air maybe contaminated.

Notwithstanding this great degree of purity, the best dephlogisticated air is capable of being contaminated by some of the processes which affect the common air of our atmosphere. Dr Priestley having introduced a quantity of very dry, clean nails, into a receiver filled with dephlogisticated air, and inverted it in quicksilver, found, that about nine months after, one-tenth of the whole quantity had disappeared, tho' he could not perceive any rust upon the nails. The effects of combustion have already been related, viz. as producing a great quantity of pure fixed air; but putrefaction and animal respiration probably contaminate it in a manner similar to that of atmospherical air, though few or no experiments seem to have been made on this subject. Mr Cavallo, however, informs us, that "when an animal is confined in a quantity of dephlogisticated air, and is kept therein till it dies, that air is not rendered so bad but that it will still be capable of considerable diminution by nitrous air. This seems to show, that dephlogisticated air is somewhat different from pure common air; or that common air is originally different from dephlogisticated air, lowered by the addition of phlogiston. The phenomenon is certainly very remarkable; and sometimes a quantity of dephlogisticated air, after having been breathed by an animal till it died, will appear by the nitrous test to be even better than common air. When the experiment is performed over lime-water (to absorb the fixed air produced in respiration), the diminution by a mixture of nitrous air is less than it would otherwise be; but it is still diminished much more than common air after an animal has died in it; which seems to intimate, that the death of the animal in dephlogisticated air is principally owing to the fixed air formed by the act of respiration. It may be said, that the inflammable principle discharged through the lungs of an animal, being perhaps combined with some other principle, requires a longer time to combine with the dephlogisticated air than the phlogiston of nitrous air; but this is only an hypothetical explanation of the abovementioned remarkable phenomenon, which requires many direct proofs."

62 Vegetation ill supported by dephlogisticated air.

Dephlogisticated air is much inferior to that of the common atmosphere in supporting vegetable life. This has been ascertained by the experiments of Dr Priestley, Mr Fontana, Mr Scheele, Dr Ingenhousz, &c. Dr Priestley took three sprigs of mint, and having put all the roots into vials containing the same pump-water which had been for some time exposed to the atmosphere, introduced one of them into a jar of dephlogisticated air, another into a jar of common air, and a third into that which had been phlogisticated with nitrous air several months before, and in such a state, that one measure of it, and one of nitrous air, occupied the space of $1\frac{3}{4}$ measures. This was done in April; and on examining them on the 12th of May following, it was found, that the plant in phlogisticated air had grown remarkably, much better than that in common air; while the plant in dephlogisticated air had a very sickly appearance. Examining them on the 26th of the same month, the appearance continued nearly as before; but it was now found, that though the plant in phlogisticated air had grown so well, the air was not sensibly improved by it, though the dephlogisticated air was injured by the plant which grew in it.

63 Dr Priestley's first hypothesis.

§ 3. *Of the Composition of Dephlogisticated Air.*—When Dr Priestley first discovered the existence of this fluid, having found that it was always procured by means of earthy substances; and that as it came over, the bubbles appeared full fine of white powder; he concluded, that it is composed of the nitrous acid and earth, with as much phlogiston as is necessary to its elasticity; and that the common atmosphere has as much more as is necessary to bring it into the mean condition in which we find it. It was not long, however, before this theory met with opposition. Dr Priestley himself, though induced, from the waste of the solid matter used in his experiments, to conclude that the air contained some quantity of earth, was nevertheless unable, by any method he could think of to ascertain that quantity. His experiments were opposed by others made by Lavoisier; who insisted, that when solution of mercury was carefully distilled, the metal was obtained in full quantity, or with scarce any loss, notwithstanding the dephlogisticated air produced. This gentleman having put two ounces and one drachm of mercury into red precipitate, and afterwards revived it, lost a very few grains of the metal; which, he says, might be the weight of a little red matter that was found adhering to the neck of the vessel. The same thing was observed by Mr Fontana, who repeated the experiment often with less than a grain

64 Difference betwixt Dr Priestley, Mr Lavoisier, &c.

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grain weight of loss. The vessel he used had a neck of about two feet long: and he particularly remarks, that, in order to succeed in this experiment, the fire should be managed with very great dexterity; for if that be too strong, part of the precipitate will be volatilized, and then the result of the experiment is precarious.

These experiments were opposed by others made by Dr Priestley, who in several trials found that a considerable quantity of the metal was always lost. In one of these experiments, out of 11 pennyweights 10 grains of mercury, the loss amounted to one pennyweight two grains. In another experiment, 88 grains were lost, out of a quantity of red precipitate, in the preparation of which half an ounce of mercury had been employed. The quantity of mercury lost in his experiments, or rather the proportion of it to that of the metal employed, was always various, and the difference not very small; whence Mr Cavallo and others, with great appearance of reason, conclude, that the true reason of any perceptible loss was the strong heat made use of in the distillation, and consequently that there is no reason to suppose that any earth exists in dephlogisticated air.

65 Earth cannot be proved to exist in dephlogisticated air.

The next question was, Whether any of the nitrous acid existed in dephlogisticated air? That it contains none in a proper state of acidity, is indeed evident from many decisive experiments; but an idea was naturally entertained, that in the formation of dephlogisticated air the nitrous acid was decomposed, and part of it entered into the composition of the aerial fluid. This gave rise to the theories of Mr Lavoisier and Mr Kirwan, which are noticed under the article Acid; as also the experiments of Mr Watt, which tended to show that no nitrous acid was destroyed in the composition of dephlogisticated air. To these Mr Kirwan replied in the manner related in that article. We shall here, however, give a quotation from Dr Priestley as a kind of addition to Mr Watt's testimony on this head, so that the reader may be the better able to determine the weight of the evidence on both sides.

66 Whether the nitrous acid enters its composition.

"At Mr Watt's request (says he), I endeavoured to ascertain the quantity of acid that was expelled from nitre, in procuring the dephlogisticated air from it. To do this, I put two ounces of purified nitre into a glass retort, and receiving the air in 300 ounce measures of water, only filled each recipient half full, and agitated the air very much in the water, in order to make the fluid imbibe as much as possible of the acid it contained. Notwithstanding this agitation, however, every vessel of the air retained a strong smell of the acid. The moment the air ceased to come, I filled a large phial with the water, and carried it to Mr Watt, who carefully examined it: and in a paper which he presented to the Royal Society, and which is published in the Philosophical transactions, he has given an account of the quantity of acid that was contained in all the 300 ounces of water: whence it may be fairly inferred, that there was no occasion to suppose that any of the acid entered into the composition of the air; but that it was all either rendered volatile or retained in the water." On the other hand, the Abbé Fontana informs us, that, in distilling an ounce of nitre with a strong heat, in order to expel dephlogisticated air from it, only a few grains of weak nitrous acid are obtained, more or less as the fire applied is weak or strong: but that the quantity of dephlogisticated air extricated from it follows the contrary rule; being greatest when the heat is most violent and suddenly applied, and less when the fire is gradually applied.

On calcining metals in dephlogisticated air, very singular phenomena are observed, which seem to throw great light upon the composition of this fluid. "One of the most simple of all phlogistic processes (says Dr Priestley), is that in which metals are melted in dephlogisticated air. I therefore began with this, with a view to ascertain whether any water be produced when the air is made to disappear in it. Accordingly, into a glass vessel, containing seven ounce-measures of pretty pure dephlogisticated air, I introduced a quantity of iron turnings, which is iron in thin small pieces, exceedingly convenient for these and many other experiments, having previously made them, together with the vessel, the air, and the mercury by which it was confined, as dry as I possibly could. Also to prevent the air from imbibing any moisture, I received it immediately in the vessel in which the experiment was made, from the process of procuring it from red precipitate, so that it had never been in contact with any water. I then fired the iron by means of a burning lens, and presently reduced the seven ounce-measures to 0.65 of a measure; but I found no more water after this process than I imagined it had not been possible for me to exclude, as it bore no proportion to the air which had disappeared. Examining the residuum of the air, I found one-fifth of it to be fixed air; and when I tried the purity of that which remained by the test of nitrous air, it did not appear that any phlogisticated air had been produced in the process: for though it was more impure than I suppose the air with which I began the experiment must have been, it was not more so than the phlogisticated air of the seven ounce-measures, which had not been affected by the process, and which must have been contained in the residuum, would necessarily make it. In this case, one measure of this residuum, and two of nitrous air, occupied the space of 0.32 of a measure. In another experiment of this kind, ten ounce-measures of dephlogisticated air were reduced to 0.8 of a measure, and by washing in lime-water to 0.38 of a measure. In another experiment, 7½ ounce-measures of dephlogisticated air were reduced to half an ounce-measure, of which one-fifth was fixed air, and the residuum was quite as pure as the air with which I began the experiment; the test with nitrous air, in the proportions abovementioned, giving 0.4 in both cases.

67 Dephlogisticated air imbibed by calces of metals.

"In these experiments the fixed air must, I presume, have been formed by the union of the phlogiston from the iron and dephlogisticated air in which it was ignited; but the quantity of it was very small in proportion to the air which had disappeared; and at that time I had no suspicion that the iron, which had been melted and gathered into round balls, could have imbibed it; a melting heat having been sufficient, as I had imagined, to expel every thing that was capable of assuming the form of air from any substance whatever. Sensible, however, that such a quantity of air must have been imbibed by *something*, to which it must have given a very perceptible addition of weight, and seeing

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ſeeing nothing elſe that could have imbibed it, it occurred to me to weigh the calx into which the iron had been reduced; and I preſently found, that the dephlogiſticated air had actually been imbibed by the melted iron, in the ſame manner as inflammable air had been imbibed by the melted calces of metals in my former experiments, however improbable ſuch an abſorption might have appeared *à priori*. In the firſt inſtance, about twelve ounce-meaſures of dephlogiſticated air had diſappeared, and the iron had gained ſix grains in weight. Repeating the experiment very frequently, I always found that other quantities of iron, treated in the ſame manner, gained ſimilar additions of weight, which was always very nearly that of the air which had diſappeared.

68 Dephlogiſticated air imbibed by iron.

69 Is capable of taking it up from the atmoſphere.

"Concluding from the preceding experiments, that iron, ſufficiently heated, was capable of ſaturating itſelf with pure air from the atmoſphere, I then proceeded to melt it with the heat of a burning lens in the open air, and I preſently found, that perfect iron was eaſily capable of being fuſed in this way, and continued in this fuſion a certain time, exhibiting the appearance of *boiling* or throwing out air; whereas it was, on the contrary, imbibing air; and, when it was ſaturated, the fuſion ceaſed, and the heat of the lens could make no farther impreſſion upon it. When this was the caſe, I always found that it had gained weight in the proportion of $7\frac{1}{2}$ to 24, which is very nearly one-third of the original weight. The ſame was the effect when I melted ſteel in the ſame circumſtances, and alſo every kind of iron on which the experiment, could be tried. But I have reaſon to think, that with a greater degree of heat than I could apply, the iron might have been kept in a ſtate of fuſion ſomewhat longer; and by that means have imbibed more than even one-third of its original weight.

70 Remarkable phenomenon attending the melting of caſt-iron.

"There was a peculiar circumſtance attending the melting of caſt iron with a burning lens, which rendered it impoſſible to aſcertain the addition that was made to its weight, and at the ſame time afforded an amuſing ſpectacle: for the moment that any quantity of it was melted, and gathered into a round ball, it began to diſperſe in a thouſand directions, exhibiting the appearance of a moſt beautiful fire-work; ſome of the particles flying to the diſtance of half a yard from the place of fuſion; and the whole was attended with a conſiderable hiſſing noiſe. Some of the largeſt pieces, which had been diſperſed in this manner, I was able to collect, and having ſubjected them to the heat of the lens, they exhibited the ſame appearance as the larger maſs from which they had been ſcattered.

"When this caſt iron was melted in the bottom of a deep glaſs receiver, in order to collect all the particles that were diſperſed, they firmly adhered to the glaſs, melting it ſuperficially, though without making it crack, ſo that it was ſtill impoſſible to collect and weigh them. However, I generally found, that, notwithſtanding the copious diſperſion, what remained after the experiment rather exceeded than fell ſhort of the original weight of the iron."

71 Formation of water from dephlogiſticated and inflammable air.

On attempting to revive this calx of iron in inflammable air, a very new and unexpected appearance took place. Having put a piece of iron ſaturated with pure air into a veſſel filled with inflammable air confined by water, the inflammable air diſappeared and the metal was revived; but on weighing it, he found that $2\frac{1}{2}$ grains out of $11\frac{1}{2}$ had been loſt, beſides the $7\frac{1}{2}$ ounce-meaſures of inflammable air which had vaniſhed. Conſidering all theſe circumſtances, the Doctor had now no doubt that the two kinds of air had united and formed either fixed air or water; and with a view to determine this point, he repeated the experiment in a veſſel where the inflammable was confined by mercury, both the veſſel and mercury having been peviouſly made as dry as poſſible. In theſe circumſtances he had no ſooner begun to heat the iron, than the air was perceived to diminiſh, and at the ſame time the inſide of the veſſel to become cloudy, with particles of dew that covered almoſt the whole of it. Theſe particles by degrees gathered into drops, and ran down in all places, excepting thoſe which were heated by the ſun-beams. On collecting the water produced in this experiment, by means of a piece of filtering paper carefully introduced to abſorb it, he found it to be as nearly as poſſible of the ſame weight with that which had been loſt by the iron; and alſo in every experiment of this kind, in which he attended to the circumſtance, he found that the quantity of inflammable air which had diſappeared was about double that of the dephlogiſticated air ſet looſe in the operation, ſuppoſing that weight to have been reduced into air. Thus, at one time, a piece of this ſlag abſorbed $5\frac{1}{2}$ ounce-meaſures of inflammable air, while it loſt the weight of about three ounce-meaſures of dephlogiſticated air, and the water collected weighed two grains. Another time a piece of ſlag loſt 1.5 grains, and the water produced was 1.7 grains. In a third caſe, where $6\frac{1}{2}$ ounce-meaſures of inflammable air were reduced to 0.92 of a meaſure, the iron had loſt the weight of 3.3 ounce-meaſures of dephlogiſticated air, or nearly two grains.

72 Quantity produced in this manner.

73 Experiments with copper.

The Doctor having ſucceeded ſo well with iron, next tried the calx of copper, or thoſe ſcales which fly off from it by hammering whilſt it is red-hot; and found water produced in the inflammable air in the ſame manner as when the ſcales of iron were uſed. On uſing precipitate *per ſe*, he imagined at firſt that water was obtained from this ſubſtance alſo; but on repeating the experiment to more advantage he found no more water than might be ſuppoſed to have been contained as an extraneous ſubſtance either in the inflammable air or in the red precipitate. With iron, however, the caſe was vaſtly different. As the Doctor had formerly ſatisfied himſelf that inflammable air always contains a portion of water, and alſo that when it has been ſome time confined by water it imbibes more, ſo as to be increaſed in its ſpecific gravity by that means, he repeated the experiment with inflammable air which had not been confined by that fluid, but was received in veſſel of dry mercury from the veſſel in which it had been generated; but in this caſe the water was produced, to appearance, as copiouſly as in the former experiment. "Indeed (ſays he), the quantity of water produced, ſo greatly exceeding the weight of all the inflammable air, is ſufficient to prove that it muſt have had ſome other ſource than any conſtituent part of that air, or the whole of it, together with the water contained in it, without taking into conſideration the correſponding loſs of weight in the iron.

"I muſt here obſerve, that the iron ſlag which I had treated in this manner, and which had thereby loſt the

the weight which it had acquired in dephlogisticated air, became perfect iron as at first, and was then capable of being melted by the burning lens again; so that the same piece of iron would serve for these experiments as long as the operator should choose. It was evident, therefore, than if the iron had lost its phlogiston in the preceding fusion, it had acquired it again from the inflammable air which it had absorbed; and I do not see how the experiment can be accounted for in any other way."

74 Iron may be made to imbibe dephlogisticated air as often as we please.

75 Experiments of Mr Cavendish, &c. on water.

As the experiments of Dr Priestley tend very much to throw some light on the composition of dephlogisticated air, we shall here give an account of some others made by Mr Cavendish, as well as those of Dr Priestley and the French chemists, upon water: From all which it is concluded by the most celebrated philosophers and chemists, That dephlogisticated air is one of the constituent and elementary parts of water, inflammable air being the other; though the opinion is still contested by some foreign chemists.

Phil. Trans. lxxiv. 125.

"As there seemed great reason," says Mr Cavendish, "to think, from Dr Priestley's experiments, that the nitrous and vitriolic acids were convertible into dephlogisticated air, I tried whether the dephlogisticated part of common air might not be converted into nitrous or vitriolic acid." For this purpose he impregnated some milk of lime with the fumes of burning sulphur, by burning 122 grains of sulphur in a large glass receiver, in which some lac calcis was included. No nitrous salt, nor any thing besides selenite, was produced in the process. Neither was any nitrous acid produced by phlogisticating common air with liver of sulphur, or by treating dephlogisticated air in the same manner. The liver of sulphur used in these experiments was made with lime; and the only observation made on this occasion was, that the selenite produced was much more soluble in water than when made with dephogisticated vitriolic acid.

76 Whether the phlogistication of air produces vitriolic acid.

To try whether any vitriolic acid was produced by the phlogistication of air, 50 ounces of distilled water were impregnated with the fumes produced on mixing 52 ounce-measures of nitrous air with a quantity of common air sufficient to decompound it. This was done by filling a bottle with some of this water, and inverting it into a bason of the same; and then by a syphon, letting in as much nitrous air as filled it half full; after which, common air was added slowly by the same syphon, till the nitrous air was decompounded. When this was done, the distilled water was further impregnated in the same manner till the whole quantity of nitrous air was employed. The impregnated water was sensibly acid to the taste; and on distillation yielded first phlogisticated nitrous acid, then water, and lastly a very acid liquor consisting of dephlogisticated nitrous acid. By saturation with salt of tartar, $87\frac{1}{4}$ grains of nitre, without any mixture of vitriolated tartar, or other vitriolic salt, were obtained.

77 Nitrous acid produced from dephlogisticated and inflammable air.

These experiments having proved unsuccessful, Mr Cavendish next proceeded to try the effects of exploding dephlogisticated and inflammable air together in close vessels. He begins with relating an experiment of Dr Priestley; in which, it was said, that on firing a mixture of common and inflammable air by electricity, in a close copper vessel holding about three pints, a loss of weight was always perceived, on an average about two grains, though the vessel was stopped in such a manner that no air could escape by the explosion. It is also related, that on repeating the experiment, in glass vessels, the inside of the glass, though clean and dry before, immediately became dewy; which confirmed an opinion he had long entertained, that common air deposits its moisture by phlogistication. The experiment, however, did not succeed with Mr Cavendish, at least with regard to the loss of weight; which never exceeded the fifth part of a grain, and commonly was nothing at all. In these experiments the greatest care was taken to observe with accuracy the diminution of air by the explosion, and quality of the remainder; from which it appeared, that 423 measures of inflammable air were nearly sufficient to phlogisticate 1000 of common air, and that the bulk of air remaining after the explosion is very little more than four-fifths of the common air employed; whence he concludes, that "when they are mixed in this proportion, almost all the inflammable, and about one-fifth of the common air, lose their elasticity, and are condensed into the dew which lines the glass."

78 Quantity of inflammable air necessary to phlogisticate common air.

To examine more exactly the nature of this dew, 500,000 grain-measures of inflammable air were burnt with about $2\frac{1}{2}$ times the quantity of common air, and the burnt air was made to pass through a glass cylinder eight feet long and three-fourths of an inch in diameter, in order to deposit the dew. The two airs were conveyed slowly into this cylinder by separate copper pipes, passing through a brass plate which stopped up one end of the cylinder; and as neither inflammable nor common air can burn by themselves, there was no danger of the flame spreading to the magazines from which they were conveyed. Each of these magazines consisted of a large tin vessel inverted into another just big enough to receive it. The inner vessel communicated with the copper pipe, and the air was forced out of it by pouring water into the outer vessel: and in order that the quantity of common air expelled should be $2\frac{1}{2}$ times that of the inflammable air, the water was let into the outer vessels by two holes in the bottom of the same tin pan; the whole which conveyed the water into that vessel in which the common air was confined being $2\frac{1}{2}$ times as big as the other. In trying the experiments, the magazines being first filled with their respective airs, the glass cylinder was taken off, and water let by the two holes into the outer vessels, till the airs began to issue from the ends of the copper pipes; they were then set on fire by a candle, and the cylinder put on again in its place. By this means upwards of 135 grains of water were left in the cylinder, which had no taste nor smell, and which left no perceptible sediment on being evaporated to dryness; neither did it yield any pungent smell during the evaporation; in short, it seemed pure water. In one of his experiments a little sooty matter was perceived, but it was found to proceed from the luting. On repeating the experiment with dephlogisticated, instead of common air, the produce was nitrous acid.

The following conclusion is drawn by Mr Cavendish from all these experiments: "There seem two ways by which the production of the nitrous acid, in the manner abovementioned, may be explained: first, by supposing that dephlogisticated air contains a little nitrous acid, which enters into it as one of the component parts;

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parts; and that this acid, when the inflammable air is in sufficient proportion, unites to the phlogiston, and is turned into phlogisticated air, but does not when the inflammable air is in too small proportion: and, secondly, by supposing that there is no nitrous acid mixed with or entering into the composition of dephlogisticated air; but that, when the air is in sufficient proportion, part of the dephlogisticated air with which it is debased is, by the strong affinity of phlogiston to dephlogisticated air, deprived of its phlogiston, and turned into nitrous acid; whereas, when the dephlogisticated air is not more than sufficient to consume the inflammable air, none then remains to deprive the phlogisticated air of its phlogiston, and turn it into acid.— If the latter explanation be true, I think we must allow that dephlogisticated air is in reality nothing but *dephlogisticated water*, or water deprived of its phlogiston; or, in other words, that water consists of dephlogisticated air united to phlogiston. On the other hand, if the former explanation be true, we must suppose, that dephlogisticated air consists of water united to a little nitrous acid, and deprived of its phlogiston; but still the nitrous acid in it must only make a very small part of the whole, as it is found that the phlogisticated air into which it is converted is very small in comparison of the dephlogisticated air. I think the second of these explanations seems much the more likely; as it was found that the acid in the condensed liquor was of the nitrous kind, not only when the dephlogisticated air was prepared from nitrous acid, but when procured from plants or turbith mineral. Another strong argument in favour of this opinion is, that dephlogisticated air yields no nitrous acid when phlogisticated by liver of sulphur; for if this air contains nitrous acid, and yields it when phlogisticated by explosion with inflammable air, it is very extraordinary that it should not do so by other means. But what forms a stronger, and, I think, almost decisive argument in favour of this explanation, is, that when the dephlogisticated air is very pure, the condensed liquor is made much more strongly acid by mixing the air to be exploded with a little phlogisticated air."

79 Conclusions from these experiments.

80 Dr Priestley's experiments.

The experiments of Dr Priestley alluded to were those in which inflammable air was supposed by Mr Lavoisier to be procured from water by passing its steam through ret-hot iron tubes. It was soon discovered, however, by Dr Priestley, that this inflammable air did not proceed from the water, but from the iron of the tube: and might be obtained by transmitting aqueous vapour through charcoal or iron placed in tubes of copper, glass, or earthen ware, made red-hot, but not through these tubes by themselves. In this case, the loss of the water employed exceeded that of the inflammable air produced in the proportion of 1.3 to 2; and the iron which had thus absorbed the water, appeared exactly similar to that which had been burned in dephlogisticated air in the manner already related. His conclusions from thence are these: "Since iron gains the same addition of weight by being melted in dephlogisticated air, and also by the addition of water when red hot, and becomes, as I have already observed, the same substance in all respects, it is evident that this air or water, as existing in the iron, is the very same thing; and this can hardly be explained but on the supposition that water consists of two kinds of air, viz. inflammable and dephlogisticated."

81 His opinion concerning the composition of water.

Of these processes he gives the following explanation: "When iron is heated in dephlogisticated air, we may suppose that, though part of its phlogistion escapes, to enter into the composition of the small quantity of fixed air which is then procured, yet enough remains to form water with the dephlogisticated air which it has imbibed, so that this calx consists of the intimate union of the pure earth of iron and of water; and therefore, when the same calx, thus saturated with water, is exposed to heat in inflammable air, this air enters into it, destroys the attraction between the water and the earth, and revives the iron, while the water is expelled in its proper form."

The whole of the Doctor's opinions on the component parts of this kind of air, however, are summed up in the following sentence in his *Observations relating to Theory*.—"The only kind of air that is now thought to be properly elementary, and to consist of a simple substance, is dephlogisticated air; with the addition at least of the principle of heat, concerning which we know very little; and as it is not probable that this adds any thing to the *weight* of bodies, it can hardly be called an *element* in their composition. Dephlogisticated air appears to be one of the elements of water, of fixed air, of all the acids, and many other substances, which, till lately, have been thought to be simple."

Observ. and Exper. vi. 402.

82 Experiments of the French philosophers.

The experiments of the French philosophers were of the same nature with those of Mr Cavendish, but conducted on a larger scale. The inference drawn from them was the same with that already mentioned, viz. that dephlogisticated and inflammable air in all cases are the two constituent parts of water. This opinion is adopted by Mr. Kirwan in his *Treatise on Phlogiston*. "The experiments of Mr Cavendish, and of Mr Monge," says he, "appear to me to leave no room to doubt, that when very pure dephlogisticated and inflammable air are inflamed, the product is mere water (A); for when these airs are employed in the proper proportion, only 0,02 of the mixture of both airs retains its aërial form. Now it is impossible to suppose that all the water obtained pre-existed in these airs; that is, that 49 parts in 50 were mere water.

83 Mr Kirwan's conclusions from them.

84 The foregoing theories not altogether satisfactory.

Notwithstanding these positive conclusions, however, by some of the most respectable names in England, the evidences adduced have been unsatisfactory to some French chemists; who maintain, that Messrs Cavendish, Priestley, and Kirwan, are totally mistaken with regard to the production of water from dephlogisticated and inflammable air; contending, that the water obtained had previously existed in the air, and was not originally produced in the operation. The fact, indeed, becomes somewhat dubious from some experiments related by Dr Priestley himself, and of which we shall now proceed to give an account.

(A) The experiments of Mr Cavendish show that nitrous acid is the product in this case. He takes notice of the difference between the result of the French experiments and his, but ascribes it to their using inflammable air prepared from charcoal: His was from zinc.

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85 Difficulties arising in some of Dr Priestley's experiments.

One consequence of the hypothesis in question is evident, that if water really be *produced* by the deflagration of either dephlogisticated or common air with inflammable air, the quantity of liquid obtained ought to increase in proportion to the quantity of the two airs consumed, and that without any limitation. This, however, is not the case, as Dr Priestley has observed. He had succeeded indeed with scales of iron and copper, as has already been related; and in the experiment with the latter, the production of water was so copious, that when only $3\frac{1}{4}$ ounce-measures of air were absorbed, the water stood in drops on the inside of the vessel, and some of these ran down it. Water was also procured by firing dephlogisticated and inflammable air from iron by the electric spark in a close vessel, an experiment similar to those made by Mr Lavoisier at Paris. In his first experiment he put 2.75 ounce-measures of a mixture of air, of which one-third was dephlogisticated and two-thirds inflammable air from iron, in a close vessel, and, after the explosion, found in it one grain of moisture; but on repeating the experiment with half as much dephlogisticated as inflammable air, he could perceive no sign of moisture. The greatest difficulty, however, which he says he ever met with respecting the preceding theory, arose from his never having been able to procure any water when he revived red precipitate in inflammable air, or at least no more than might have been supposed to be contained in the inflammable air as an extraneous substance.

In order to make the experiment with the scales of iron and that with the red pecipitate as much alike as possible, and compare them both to the greatest advantage, he made them one immediately after the other with every circumstance as nearly the same he could. The inflammable air was the same in both experiments, and both the scales of iron and red precipitate were made as dry as possible. They were heated in vessels of the same size and form, and equally confined by dry mercury: and yet with the former, water was produced as copiously as before, viz. running down the inside of the vessel in drops, when only four ounce-measures of inflammable air were absorbed; but though he heated the red precipitate till eight ounce-measures of the inflammable air were absorbed, and only 0.75 of an ounce-measure remained, there was hardly any sensible quantity of water produced, "certainly," says he, "not one-tenth of what appeared in the experiment with the scales of iron. In this experiment there can be no doubt but that the dephlogisticated air produced from the red precipitate mixed with the inflammable air in the vessel; and as no *water* equal to the weight of the two kinds of air was produced, they must have formed some more *solid substance*, which, in the small quantities I was obliged to use, could not be found.

"The difficulty, with respect to what becomes of the two kinds of air, was not lessened by the attempts which I made to collect all that I could from repeated decompositions of inflammable and dephlogisticated air in a close vessel. As I had produced water in this process when no more than a single explosion was made at a time, I thought that by continuing to make explosions in the same vessel, the water would not fail to accumulate till any quantity might be collected; and I intended to have collected a considerable part of an ounce. And as I would know exactly what quantity of air I decomposed, I had no doubt of being able to ascertain the proportion that the water and air bore to each other. With this view a mixture was made of a large quantity of air, one-third dephlogisticated and two-thirds inflammable, from iron and oil of vitriol.—But though I had a sensible quantity of water at the first explosion (in each of which between four and five ounce-measures of the mixture of air were used), I was surprised to perceive no very sensible increase of the quantity of water on repeating the explosions. Having therefore expended 48 ounce-measures of the mixture, the process was discontinued; and, collecting the water with all the care that I could, I found no more than three grains, when there ought to have been eleven.

"In this process the inside of the vessel was always very black after each explosion; and when I poured in the mercury after the explosion, though there was nothing visible in the air within the vessel, there issued from the mouth of it a dense vapour. This was the case, though I waited so long as two minutes after any explosion, before I proceeded to put in more mercury in order to make another; which, if the vapour had been steam, would have been time more than sufficient to permit it to condense into water. I even perceived this vapour when I had a quantity of water in the vessel, and the explosion was consequently made over it, as well as in contact with the sides of the vessel which were wetted with it; so that, as this vapour had passed through the whole body of water when the vessel was inverted, it is probable that it must have consisted of something else than mere water. But I was never able to collect any quantity of it, though it must have been something produced by the union of the two kinds of air."

86 Incondensible vapour arising from water.

In order to collect a quantity of this vapour, he contrived an apparatus, which, by diffusing it through a thin glass vessel, he supposed would condense all the contents whether fluid or solid; but after repeating the experiment as carefully as possible, by taking 20 explosions, and repeating the whole several times over, he could find nothing in the vessel besides a small quantity of water, which, added to that in the strong vessel, came far short of the weight of the air that was decomposed.

87 Priestley's conjecture concerning this vapour.

"All the conjecture," say he, "that I can advance, in order to explain this phenomenon is, that since soot yields pure air, part of the soot is formed by the union of the dephlogisticated air in the atmosphere, and the inflammable air of the fuel: but *smoke*, which contains much *soot*, is soon dispersed, and becomes invisible in the open air. Such, therefore, may be the case here. The soot formed by the union of the two kinds of air, may be diffused through the air, in the vessel in which they are exploded, and be carried invisibly into the common atmosphere; which may account for my not being able to collect any quantity of it in this apparatus."

88 Unsuccessful attempts to collect it.

Not discouraged by this bad success, the Doctor attempted to collect this volatile matter by means of a quantity of water incumbent upon the mercury in the strong glass vessel in which the explosions were made, though he had found that part of it could escape through the water. He decomposed a great quantity of the two kinds of air in these circumstances; and presently

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sently found that the water became very cloudy, and was at length filled with a blackish matter. This he collected, and found that it remained perfectly black upon the earthen vessel in which the water containing it was evaporated; which would not have been the case if the blackish matter in the water had been that powder of mercury which is produced by agitating it in pure water: For that black mass always became white running mercury the moment the water was evaporated from it. If a sufficient quantity of this matter could have been procured, he could have satisfied himself whether it was soot or not.

89 Water in considerable quantity obtained from dephlogisticated and inflammable air See Plate X. fig. 3.

"That water in great quantities (says), is sometimes produced from burning inflammable and dephlogisticated air, is evident from the experiments of Messrs Cavendish and Lavoisier. I have also frequently collected considerable quantities of water in this way, though never quite so much as the weight of the two kinds of air decomposed. My apparatus for this purpose was the following: Into the mouth of a large glass balloon, I introduced a tube, from the orifice of which there continually issued inflammable air from a vessel containing iron and oil of vitriol. This being lighted, continued to burn like a candle. Presently after the lighting of it, the inside of the balloon always became cloudy, and the moisture soon gathered in drops, and settled in the lower part of the balloon To catch what might issue in the form of vapour, in the current of air through the balloon, I placed the glass tube *b*, in which I always found some water condensed. It is very possible, however, that in both these modes of experimenting, the water may be converted into a kind of vapour, which is very different from steam, and capable of being conveyed a great way through air, or even water, without condensation along with the air with which it is mixed; and on this account it may not be possible, in either of these modes of experimenting, to collect *all* the water into which the two kinds of air may be converted. The nature of this kind of vapour into which water may be changed, and which is not readily condensed by cold, is very little understood, but well deserves the attention of philosophers.

"That the water collected in the balloon comes from the decomposition of the air, and not from the fresh air circulating through it, was evident from placing balls of hot iron in the place of the flame, and finding that, though the balloon was as much heated by them as by the flame of the burning of the inflammable air, and consequently there must have been the same current of the external air through it, no moisture was found in the balloon."

Sect. IV. *Of Phlogisticated Air.*

89 Phlogistication of air explained.

The universal prejudice in favour of the existence of that principal named *Phlogiston*, first suggested by Stahl, gave rise, on the first appearance of Dr Priestley's discoveries, to a theory, concerning the action of this substance upon air and other bodies. As it had been observed, that air was diminished, in some cases at least, by burning, universally by respiration, and by some other processes, it was imagined that phlogiston was a body of such a singular nature, that when mixed with air, it always diminished its bulk, instead of enlarging it, which might have been more naturally expected from the mixture of any vapour whatever. It was also supposed by some, that the phlogiston was not only entirely devoid of gravity, but that it was a principle of *positive levity*; so that the *absolute* weight of bodies was diminished by an union with it, and augmented when it was expelled, though their *specific* gravity was diminished. Various other surprising properties were attributed to phlogiston: such as that of giving elasticity to air, of constituting flame by a *chemical combination* with air, &c. Its emission into the atmosphere was supposed to be alway as attended with a diminution of air; and therefore, all processes in which air was diminished and became noxious, such as that by liver of sulphur, a mixture of iron filings and brimstone, &c. were called *phlogistic processes*. Respiration of animals was taken into the same account; but neither in this, nor in combustion, was it allowed that any kind of vital spirit was absorbed by the blood, or separated from the air by the burning body. On the contrary, it was strenuously argued, that all this was performed by the *emission* of *phlogiston* from the lungs or the inflamed substance, which depraved the air, and diminished it in bulk; and as all air was supposed to contain phlogiston, it was likewise imagined, that in all cases where air was mended, as by the growing of vegetables, or agitation in water, the emendation was accomplished, not by the emission of any thing into the atmosphere, but by the mere absorption of phlogiston. In other respects this substance was thought to be an exceedingly powerful principle in nature; the light of the sun itself and the electric fluid being said to be modifications of it, the different kinds of airs to be *phlogistic vapours*, &c.; so that the whole system of nature seemed ready to be absorbed by it at once.

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90 Too great powers attributed to phlogiston.

91 Doctrine of phlogiston opposed by the foreign chemists.

The formidable powers of this principle were first checked by the discoveries of Mr Lavoisier, though the latter erred equally on the contrary side; and not content with keeping the phlogistic principle within due bounds, would needs deny its existence altogether *. In a treatise published in the year 1782, he first impugns Dr Priestley's theory of respiration, and denies that "the respiration of animals has the property of phlogisticating air in a manner similar to what is effected by the calcination of metals and many other chemical processes; and that it ceases not be respirable till the instant when it becomes surcharged, or at least saturated, with phlogiston."

* See *Phlogiston.*

92 Mr Lavoisier's experiments on calcination of metals and respiration.

In order to disprove this assertion, he introduced four ounces of mercury to 50 cubic inches of common air, proposing to calcine the metal by keeping it for 12 days in a heat almost equal to that which is necessary to make it boil. After the expiration of the appointed time, 45 grains of precipitate *per se* were formed, and the air in the vessel was diminished by about $\frac{1}{6}$th of its volume. In this state it did not precipitate lime water; but instantly extinguished candles, and killed animals immersed in it; no longer affording any red vapours, or being diminished by mixture with nitrous air: On distilling the precipitate produced, about as much dephlogisticated air was obtained as had been left by the common air in the calcination; and by recombining this with the noxious air left in the vessel, he recomposed a fluid nearly of the same goodness with common air. Hence he draws the following conclusion:

Phlogiſticated air.

ſions: 1. That $\frac{5}{6}$ths of the air we breathe are mephitic, or incapable of ſupporting the reſpiration of animals, or the inflammation and combuſtion of bodies. 2. That the ſurplus, or only $\frac{1}{6}$th of the volume of atmoſpherical air, is reſpirable. 3. That in the calcination of mercury, this metallic ſubſtance abſorbs the ſalubrious part, leaving only the mephitic portion of the air. 4. That by reuniting theſe two portions which had been ſeparated, we can recompound air ſimilar to that of the atmoſphere.

93 Compoſition of atmoſpherical air.

94 Effects of reſpiration on air.

To determine the effects of reſpiration upon air, a live ſparrow was placed under a glaſs receiver, filled with common air and inverted in mercury, containing 31 cubic inches. In a quarter of an hour it became agitated, and in 55 minutes died convulſed. Notwithſtanding the heat of the animal, which neceſſarily, at firſt, rarified the air in the receiver, there was a ſenſible diminution of its bulk; which, at the end of 15 minutes, amounted to one-fortieth: but, inſtead of increaſing afterwards, the diminution became ſometh ing leſs in about half an hour; and when the animal was dead, and the air in the receiver had recovered the temperature of the room where the experiment was made, the diminution did not appear to exceed one-ſixteenth part.—This air which had been reſpired by the ſparrow, though in many reſpects ſimilar to that in which the mercury had been calcined, differed from it in this reſpect, that it precipitated lime-water, and, by introducing cauſtic fixed alkali to it, was reduced one-ſixth in bulk by the abſorption of fixed air; after which it appeared exactly the ſame with that produced by the calcination of mercury or other metals; and atmoſpherical air was recompoſed by mixing this with pure dephlogiſticated air in the proportions already mentioned.

95 Sheele's experiments.

That common air is compounded of two kinds of elaſtic fluids, Mr Scheele has proved by the following experiment: "I diſſolved (ſays he) one ounce of alkaline liver of ſulphur in eight ounces of water; of this ſolution I poured four ounces into an empty bottle, whoſe capacity was 24 ounces, and worked it well; then I turned the bottle, immerſed its neck into a ſmall veſſel with water, and kept it in this poſition a fortnight. The ſolution had partly loſt its red colour, and ſome ſulphur had been precipitated from it during this time. After this I put the bottle in the ſame poſition in a larger veſſel with water, keeping the mouth and neck under water, and the bottom of the bottle above water, and thus I drew the cork under water, which immediately ruſhed with violence into the bottle. On examining the quantity of water in the bottle, it was found, that during this fortnight, ſix parts out of 20 of air were loſt." On repeating the experiment with the ſame materials, and in the ſame bottle, only four parts out of 20 were loſt by ſtanding a week, and no more than ſix after four months.

96 Compoſition of atmoſpherical air demonſtrated.

From theſe experiments, and many others ſimilar, it appears that the doctrine of phlogiſton had been carried too far by Dr Prieſtley and other Britiſh philoſophers, and that the air conſiſts of two kinds of fluids; one perfectly ſalutary, and friendly in the higheſt degree to animal life; the other altogether unfit for it. Theſe two appear incapable of being converted directly into one another by any proceſs, natural or artificial: for though both are deſtructible, yet they are always converted into other ſubſtances; from which indeed, either the one or the other may be extracted at pleaſure by employing the proper methods. The ſtrongeſt arguments in favour of the tranſmutation of phlogiſticated air into that of a pure kind, were drawn from the purification of noxious air by vegetation, and by agitation in water. In the former caſe, however, it has been obſerved in the laſt ſection, that this ſeeming purification is no other than an exchange of the one air for the other; the vegetables abſorbing the phlogiſticated, and emitting the dephlogiſticated air in its ſtead. With reſpect to the agitation in water, the matter remained more dubious; and it is only in the laſt volume of Dr Prieſtley's treatiſe that we have any account of this being accompliſhed by an emiſſion of purer air from the water.—"In the infancy of my experiments," ſays he, "I concluded, that all kinds of air were brought by agitation to the ſame ſtate; the pureſt air being partially phlogiſticated, and air completely phlogiſticated being thereby made purer; inflammable air alſo loſing its inflammability, and all of them brought into ſuch a ſtate as that a candle would juſt go out in them. This inference I made from all the kinds of air with which I was then acquainted, and which did not require to be confined by mercury, being brought to that ſtate by agitation in a trough of water, the ſurface of which was expoſed to the open air; never imagining that when the air in my jar was ſeparated from the common air by a body of water, generally about twelve inches in depth (adding that within to that without the jar), they could have any influence on each other. I have, however, been long convinced, that, improbable as it then appeared to me, this is actually the caſe."

97 How air is purified by agitation in water Exper. and Obſerv. vi. 385

98 Water pervious to air, and purifies it in paſſing through.

This remarkable fact is illuſtrated by the following experiments: 1. About three ounce-meaſures of air, phlogiſticated by nitrous air, was agitated for a quarter of an hour in a veſſel containing 20 ounces of water, which had been boiled for ſeveral hours, and which was ſtill very warm. By this proceſs it became diminiſhed one-ſixth, and conſiderably improved in quality. The next day the remainder was agitated for another quarter of an hour, and the water which had been boiled at the ſame time, when it was alſo diminiſhed in quantity and improved in quality. 2. An equal quantity of air, phlogiſticated by means of iron-filings and brimſtone, being agitated for 20 minutes, was diminiſhed one-ſeventh, and improved ſo far that a candle would burn in it. 3. After expelling all the air he could from a quantity of water by boiling, he put to it, in ſeparate phials, air that had been phlogiſticated with iron-filings and brimſtone, as well as that which the heat had expelled, leaving them with their mouths in water, and agitating them occaſionally. On examining the phials in about two months, he found both the air that was confined by water and that which had been expelled by heat completely phlogiſticated. 4. That water does imbibe the purer part of the atmoſphere, in preference to that which is impure, is evident, he ſays, from any examination of it: For if the water be clear, and free from any thing that is putreſcent, the air expelled from it by heat is generally of the ſtandard of 1; whereas that of the atmoſphere, when the nitrous air is the pureſt, is about 1.2.

99 Properties of phlogiſticated air.

Phlogiſticated air is equally inviſible with common air, and ſomething more elaſtic. Mr Kirwan procured

cured ſome perfectly phlogiſticated, ſo that it was not in the leaſt diminiſhed by nitrous air, from a mixture of iron-filings and brimſtone. Having dried it by frequently introducing dry filtering paper under the jar that contained it, he found its weight to be to that of the common air as 985 to 1000, the barometer ſtanding at 30.46 and the thermometer at 60°. The other properties of it are, that it is extremely fatal to animal life, and friendly to that of vegetables, inſomuch that it is now generally believed to be the true and proper nouriſhment of the latter. It ſeems to exiſt originally, in very large quantity, in our atmoſphere. It may be ſeparated from the common maſs of air by combuſtion, by reſpiration, by putrefaction, and in ſhort by every ſpecies of phlogiſtic proceſs; neither is there any other ſpecies of air but what may be converted into this by means of fire, dephlogiſticated air alone excepted.

100 Nitrous acid procured from phlogiſticated air.

Phlogiſticated air is now generally believed to be a combination of the nitrous acid with phlogiſton; and that, in its gradual progreſs towards this, which is its ultimate ſtage, it firſt aſſumes the character of phlogiſticated nitrous acid; then of nitrous air, in which it readily parts with its phlogiſton to the atmoſphere, or rather to the dephlogiſticated part of it; and laſtly, it becomes phlogiſticated air, in which the union betwixt the principles is ſo ſtrong, that it cannot be broken by ſimple expoſure to dephlogiſticated air without heat; though the experiments of Mr Cavendiſh ſhow, that this may be done by means of the electric ſpark, which produces the moſt violent heat we can imagine.

It had been frequently obſerved, that common atmoſpherical air was always diminiſhed by taking the electric ſpark in it; and this diminution was ſuppoſed to be occaſioned by the *phlogiſtication* of the air, and ſeparation of its fixed part; in conſequence of which it was urged, that lime-water is precipitated by taking the electric ſpark over it in a ſmall quantity of air.

101 Mr Cavendiſh's experiments on the production of nitrous acid.

Mr Cavendiſh, however, who has carefully examined this ſubject, denies that any fixed air is produced in this manner; and by a ſet of very curious experiments, publiſhed in the 75th volume of the Philoſophical Tranſactions, has clearly ſhown that nitrous acid, and not fixed air, is the product of this operation.

The apparatus uſed in theſe experiments, was that repreſented Plate X. fig. 4. and conſiſts only of a crooked glaſs tube, whoſe ends are plunged into quickſilver contained in two glaſſes, in the middle part of which the air is confined betwixt the two portions of quickſilver. The air was introduced by means of a ſmaller tube, fig. 5. the tube M of the former figure being filled with quickſilver, the bent end of which was introduced into a jar DEF, filled with the proper kind of air, and inverted in water. The end C being ſtopped by the finger, the quickſilver was thus prevented from falling out, let the tube be placed in what poſition it would, until this preſſure was removed. Upon introducing the crooked tube into the jar in the poſition repreſented in the figure, and removing the finger from the orifice at C, the quickſilver would deſcend; and by ſtopping this orifice again, any quantity of the fluid may be allowed to run out, and the empty ſpace of the tube will be filled with the air deſired. Having thus got the proper quantity of air into the tube ABC, it was held with the end C uppermoſt, and ſtopped with the finger; and the end A, made ſmaller for that purpoſe, being introduced into the end of the bent tube M, the air, on removing the finger from C, was forced into that tube by the preſſure of the quickſilver in the leg BC. Thus he was enabled to introduce any quantity he pleaſed of any kind of air into the tube M; and by the ſame means it was in his power to let up any quantity of ſoap-ley, or other liquor which he wanted to be in contact with it. In one caſe, however, in which he wiſhed to introduce air into the tubes many times in the ſame experiment, he made uſe of the apparatus repreſented fig. 6. conſiſting of a tube AB, of a ſmaller bore, a ball C and a tube DE of a larger bore. This apparatus was firſt filled with quickſilver; and then the ball C and the tube AB were filled with air, by introducing the end A under a glaſs inverted into water, which contained the proper kind of air, and drawing out the quickſilver from the leg ED by a ſyphon. After being thus furniſhed with air, the apparatus was weighed, and the end A introduced into one end of the tube M, and kept there during the experiment; the way of forcing air out of this apparatus into the tube being by thruſting down the tube ED, a wooden cylinder of ſuch a ſize as almoſt to fill up the whole bore, and by occaſionally pouring quickſilver into the ſame tube, to ſupply the place of that puſhed into the ball C. After the experiment was finiſhed the apparatus was weighed again, which ſhowed exactly how much air had been forced into the tube M during the whole experiment; it being equal in bulk to a quantity of quickſilver, whoſe weight was equal to the increaſe of weight of the apparatus. The bore of the tube M, uſed in theſe experiments, was about the tenth of an inch in diameter; and the length of the column of air occupying the upper part of the tube was in general from $\frac{3}{4}$ths to $1\frac{1}{2}$ inches.—In order to force an electrical ſpark through the tube M, it was neceſſary to place an inſulated ball at ſuch a diſtance from the conductor as to receive a ſpark from it, and to make a communication between that ball and the quickſilver in one of the glaſſes, while the quickſilver in the other glaſs communicated with the ground.

When the electric ſpark was made to paſs through common air included between ſhort columns of a ſolution of litmus, the ſolution acquired a red colour, and the air was diminiſhed, as had been obſerved by Dr Prieſtley. When lime-water was uſed inſtead of the ſolution of litmus, and the ſpark was continued till the air could be no further diminiſhed; but not the ſmalleſt cloud could be perceived in the water, though the air was reduced to two thirds of its original bulk; which is a greater diminution than it could have ſuffered by any phlogiſtic proceſs, that being little more than one-fifth of the whole. The experiment being repeated with impure dephlogiſticated air, a great diminution took place, but without any cloud in the lime-water. Neither was any cloud produced when fixed air was let up into it; but, on the addition of a little cauſtic volatile alkali, a brown ſediment immediately appeared.

It being thus evident that the lime was ſaturated by ſome acid produced in the operation, the experiment was repeated with ſoap-leys to diſcover the nature of it. A previous experiment had been made in order to know what degree of purity the air ought to be of to produce the greateſt diminution; and thus it was found,

Phlogisticated Air.

102 Proportions of the different airs necessary for the production of nitrous acid.

found, that when good dephlogisticated air was used, the diminution was but small; where perfectly phlogisticated air was made use of, no sensible diminution took place; but when five parts of pure dephlogisticated air were mixed with three of common air, almost the whole was made to disappear.—It must be remembered, that common air consists of one part of dephlogisticated and four of phlogisticated air; so that a mixture of five parts of pure dephlogisticated air and three of common air, is the same thing as a mixture of seven parts of dephlogisticated air with three of phlogisticated. Having made these previous trials, he introduced into the tube a little soap-leys, and then let up some dephlogisticated and common air mixed in the abovementioned proportions, which, rising in the tube M, divided the soap-leys into its two legs. As fast as the air was diminished by the electric spark, he continued to add more of the same kind till no further diminution took place. The soap-leys being then poured out of the tube, and separated from the quicksilver, seemed to be perfectly neutralized, as they did not at all discolour paper tinged with blue flowers. On evaporating the liquor to dryness, a small quantity of salt was left, which was evidently nitre, from the manner in which a paper impregnated with the solution of it burned. On repeating the experiment on a larger scale, with five times the quantity of materials, pure nitre was obtained in proportion, and was found by the test of *terra ponderosa salita*, to contain no more vitriolic acid than what might have been expected in the soap-ley itself, and which is exceedingly small.

103 Mr Cavendish's opinions on nature of phlogisticated air.

As, in some former experiments of Mr Cavendish, it had been found, that by deflagrating nitre with charcoal, the whole of the acid was converted into phlogisticated air, he concluded that this kind of air is nothing else than nitrous acid united to phlogiston; according to which, it ought to be converted into nitrous acid by being deprived of its phlogiston. "But (says he) as dephlogisticated air is only water deprived of phlogiston, it is plain, that adding dephlogisticated air to a body, is equivalent to depriving it of phlogiston, and adding water to it; and therefore phlogisticated air ought also to be reduced to nitrous acid, by being made to unite or form a chemical combination with dephlogisticated air; only the acid thus formed will be more dilute than if the phlogisticated air was simply deprived of phlogiston.

"This being premised, we may safely conclude, that in the present experiments, the phlogisticated air was enabled, by means of the electrical spark, to unite to, or form a chemical combination with, the dephlogisticated air, and was thereby reduced to nitrous acid, which united to the soap-leys, and formed a solution of nitre; for in these experiments the two airs actually disappeared, and nitrous acid was formed in their room: and as it has been shown, from other circumstances, that phlogisticated air must form nitrous acid when combined with dephlogisticated air, the abovementioned opinion seems to be sufficiently established. And a further confirmation is, that no diminution of air is perceived when the electric spark is passed either through pure dephlogisticated or through perfectly phlogisticated air; which indicates a necessity for the combination of the two in order to produce nitrous acid. It was also found by the last experiment, that the quantity of nitre produced was the same that would have been obtained from the soap-leys, had they been saturated with nitrous acid; which shows, that the production of the nitre was not owing to any decomposition of the soap-leys.

"The soap-leys used in the foregoing experiments were made from salt of tartar prepared without nitre, and were of such a strength as to yield one-tenth of their weight of nitre when saturated with nitrous acid. The dephlogisticated air was also produced without nitre; that used in the first experiment with the soap-leys being procured from the black powder formed by the agitation of quicksilver mixed with lead, and that used in the latter from turbith mineral. In the first experiment, the quantity of soap-leys used was 35 measures, each of which was equal in bulk to one grain of quicksilver; and that of the air absorbed was 416 such measures of phlogisticated air and 914 of dephlogisticated. In the second experiment, 178 measures of soap-leys were used; which absorbed 1920 of phlogisticated air and 4860 of dephlogisticated. It must be observed, however, that in both experiments some air remained in the tube undecomposed, whose degree of purity I had no means of trying; so that the proportion of each species of air absorbed cannot be known with much exactness.

"As far as the experiments hitherto published extend, we scarcely know more of the nature of the phlogisticated part of the atmosphere, than that it is not diminished by lime-water, caustic-alkalies, or nitrous air; that it is unfit to support fire or maintain life in animals; and that its specific gravity is not much less than that of common air: so that though the nitrous acid, by being united to phlogiston, is converted into air possessed of these properties; and, consequently, though it was reasonable to suppose, that part at least of the phlogisticated air of the atmosphere consists of this acid united to phlogiston; yet it might be fairly doubted whether the whole is of this kind, or whether there are not, in reality, many different substances confounded by us under the name of phlogisticated air. I therefore made an experiment to determine whether the whole of a given portion of the atmosphere could be reduced to nitrous acid, or whether there was not a part of a different nature from the rest, which would refuse to undergo that change. For this purpose, I diminished a similar mixture of dephlogisticated and common air in the same manner as before, until it was reduced to a small part of its original bulk; after which some dephlogisticated air was added, and the spark continued until no further diminution took place. Having by these means condensed as much as I could of the phlogisticated air, I let up some solution of liver of sulphur to absorb the dephlogisticated air; after which only a small bubble of air remained unabsorbed, which certainly was not more than $\frac{1}{120}$th of the bulk of the phlogisticated air let up into the tube; so that if there is any part of the phlogisticated air of our atmosphere which differs from the rest, and cannot be reduced to nitrous acid, we may safely conclude, that it is not more than $\frac{1}{120}$th part of the whole."

104 Experiment to determine the nature of phlogisticated air.

Though these experiments had shown that the chief cause of this diminution of airs is the conversion of the phlogisticated kind into nitrous acid, it seemed not

Phlogisticated Air.

not unlikely, that when any liquor containing inflammable matter was in contact with the air in the tube, some of this matter might be burnt by the spark, and thereby diminish the air. In order to determine this, the electric spark was passed through dephlogisticated air included between different liquors; and the result of the experiments was, that when dephlogisticated air, containing only $\frac{1}{20}$th part of its bulk of phlogisticated air, was confined between short columns of soap-leys, and the spark passed through it till no farther diminution could be perceived, the air lost $\frac{43}{200}$ds of its bulk; which is not a greater diminution than might very likely proceed from the decomposition of the small quantity of phlogisticated air contained in it, as the dephlogisticated air might easily be mixed with a small quantity of common air while putting into the tube. When the same dephlogisticated air was confined between columns of distilled water, the diminution was rather greater than before, and a white powder was formed on the surface of the quicksilver beneath: the reason of which, in all probability, was, that the acid produced in the operation corroded the quicksilver, and formed the powder; and that the nitrous air produced by that corrosion united to the dephlogisticated air, and caused a greater diminution than would otherwise have taken place. When a solution of litmus was used instead of distilled water, the solution soon acquired a red colour; which grew paler and paler as the spark was continued, till it became quite colourless and transparent. The air was diminished by almost one-half, and might perhaps have been further diminished had the spark been continued. When lime-water was let up into the tube, a cloud was formed, and the air was further diminished by about one-fifth; the remainder was good dephlogisticated air. In this experiment, therefore, the litmus was, if not burnt, at least decompounded, so as to lose entirely its purple colour, and to yield fixed air; so that, though soap-leys cannot be decompounded by this process, yet the solution of litmus can, and so very likely might the solutions of many other substances be. But there is nothing in any of these experiments which favours the opinion of the air being at all diminished by means of phlogiston communicated to it by the electric spark.

105 Effects of the electric spark on dephlogisticated air inclosed between different liquors.

Sect. V. *Of Fixed Air.*

106 Fixed air found in a great variety of substances.

The discovery of this kind of air is as old as Van Helmont; who gave it the name of *gas silvestre*, from its being emitted in great quantity by burning charcoal. Subsequent discoveries showed, that a fluid of the same kind was plentifully produced by fermenting liquor, in almost every kind of combustion, and naturally generated in vast quantity in mines and coal-pits, where it is known by the name of the *choak-damp*; that it exists in a concrete state in alkaline salts, chalk, limestone, the shells of marine animals, magnesia alba, &c. in a very large proportion, constituting one-half, and sometimes more of their weight; and that it might always be extracted from the atmosphere, in unlimited quantity, by exposing certain substances to it.— On examining the nature of this fluid, it was found so manifestly acid, that it has now obtained a place among these substances under the name of *aërial acid*; or, more improperly, *cretaceous acid*, from its being contained in great quantities in chalk, as has been already mentioned.

Fixed Air.

107 Specific gravity, &c. of fixed air.

Fixed air is the heaviest of all permanently elastic fluids, excepting those derived from the mineral acids. Mr Kirwan determines it to be to common air as 1500 to 1000, the barometer being at 29.85, the thermometer at 64, and the fixed air being extracted from calcareous spar by marine acid, whose specific gravity was 1.0145. He observes, however, that though this air was obtained in the driest manner possible, and that the globe which contained it appeared perfectly free from moisture; yet, when carried into a room 27 degrees colder, the inside of the globe was covered with dew, which soon formed visible drops.—In its concrete state, fixed air is one of the heaviest bodies in nature. Mr Kirwan, in the 71st volume of the Philosophical Transactions, gives an account of his ingenious method of finding the specific gravity of fixed air in its fixed state, when combined with calcareous earth, from which it appears, that fixed air, in that state, is prodigiously concentrated, and, were it possible to exist by itself in that concentrated state, it would be the heaviest body known, gold and platina excepted.

Mr Kirwan first ascertained the specific gravity of a piece of white marble; then expelled the fixed air from a known weight of it finely powdered, by means of diluted vitriolic acid; the bulk and weight of the obtained fixed air being ascertained. Next, he calcined a known quantity of the same sort of marble, by keeping it in a white heat for the space of 14 hours; after which, being weighed again, and from the weight lost by this calcination, the weight of the fixed air, whieh must have escaped from it according to the abovementioned experiment, being subtracted, the remainder is the weight of water contained in the marble; from which experiments it appears, that 100 grains of the marble contained 32.42 grains of fixed air, 11.66 grains of water, and 55.92 grains of pure calcareous earth.

"I next (says he) proceeded to discover the specific gravity of the lime. Into a brass box, which weighed 607.65 grains, and in the bottom of which a small hole was drilled, I stuffed as much as possible of the finely-powdered lime, and then screwed the cover on, and weighed it both in air and in water. When immersed in this latter, a considerable quantity of common air was expelled; when this ceased, I weighed it. The result of this experiment was as follows:

	Grains.
Weight of the box in air - -	607.65
Its loss of weight in water -	73.75
Weight of the box and lime in air -	1043.5
Weight of the lime singly in air -	435.85
Loss of weight of the box and lime in water	256.5
Loss of weight of the lime singly -	182.3

"Hence, dividing the absolute weight of the lime by its loss in water, its specific gravity was found to be 2.3908.

"From these data I deduced the specific gravity of fixed air in its fixed state; for 100 grains of marble consist of 55.92 of earth, 32.42 of fixed air, and 11.66 of water; and the specific gravity of the marble is 2.717. Now the specific gravity of the fixed air, in its fixed state, is as its absolute weight, divided by its loss of weight in water; and its loss of weight in water is as the

the loss of 100 grains of marble, *minus* the losses of the pure calcareous earth and the water.

Loss of 100 grs. of marble $= \frac{100}{2.717} = 36.8$ grs.

Loss of 55.92 grs. of calcareous earth - - - $= \frac{55.92}{2.39} = 23.39$ grs.

Loss of 11.66 grs. of water $=$ - 11.66

35.05

"Then the loss of the fixed air $36.8 - 35.05 = 1.75$; consequently its specific gravity is $\frac{32.42}{1.75} = 18.52$."

108 Its other properties.

Fixed air differs considerably in its properties from the airs already mentioned. Its acidity is manifest to the taste, and still more from its neutralising both fixed and volatile alkalis; which it will do in such a manner as not only to destroy their causticity, but to give them a manifestly acid taste, and will moreover enable them to form crystals of a neutral or acidulous salt. It has a considerable antiseptic power, and will even check the putrefaction of animal substances; tho' it has been observed, that in this case it acts only by absorbing the putrid effluvia already emitted from the body, and becomes itself very offensive, while it sweetens the other. When taken into the lungs, it is equally poisonous with phlogisticated or any other noxious air, and extinguishes flame as effectually; but, when mixed with dephlogisticated air, may be inspired without any danger, and even in its pure state may be swallowed in large quantities, not only without danger, but with the most salulary effects in some diseases, whence it has now become an article of the Materia Medica. As an acid it stands in the lowest rank, being expelled from alkalis by every other; though it is capable of separating oils, sulphur, and the colouring matter of Prussian blue, from the substances with which they are combined.

109 Constituent principles of fixed air.

The origin of this acid was for a long time as much unknown as that of the others; and while the general prejudice remained that acids were a kind of primary elements unchangeable in their nature, it was supposed that fixed air was some modification of the others, probably the nitrous. But the discoveries made of late years, have abundantly shown, that the chemical principles are by no means so indestructible as they were imagined; and that the vegetable acids particularly, may be almost totally resolved into fixed air. Hence it was naturally suggested, that fixed air itself might be a compound of some other principles; and it was suggested by Dr Black, that it was a combination of atmospherical air with phlogiston. As the air of our atmosphere, however, is compounded of two substances, one of which naturally contains no phlogiston, and the other as much as it can hold; it seemed unlikely that there should be any possibility of adding to the quantity of phlogistion contained in a portion of the atmosphere, without decomposing it in some manner or other. Succeeding experiments evinced, that it was by a decomposition of the pure part of atmospherical air, and a combination of the phlogiston of the fuel with its basis, that fixed air was produced; and this fact was evinced by numerous experiments made by Mr Kirwan, Mr Lavoisier, and Dr Priestley, so that it is now looked upon to be generally established: and as the experiments made by Dr Priestley appear fully as convincing as any, we shall here content ourselves with giving an account of them.

110 Dr Priestley's experiments on the composition of fixed air.

The compound nature of fixed air, and the principles from which it is formed, were first discovered by Mr Kirwan; but Dr Priestley was not convinced by the proofs he adduced, till after making some experiments of his own. The first was, by firing shavings of iron in dephlogisticated air; when he observed a considerable residuum of fixed air, though that in the receiver had been of the purest dephlogisticated kind, and iron could only have yielded inflammable air. The hypothesis of Mr Kirwan was still further confirmed by an experiment in which iron-filings, which could only have yielded inflammable air, were mixed with red precipitate, which is known to yield only pure dephlogisticated air. On heating these in a glass retort, they gave a great quantity of fixed air, in some portions of which nineteen-twentieths were absorbed by lime-water, and the residuum was inflammable; but when the red precipitate was mixed with powdered charcoal, which had been found to yield only inflammable air, the fixed air produced from it was so pure that only one-fortieth part remained unabsorbed by water, which is as pure as that generally prepared from chalk and oil of vitriol. In some of these experiments it appeared, that three ounce-measures of dephlogisticated air went to the composition of two of fixed air: for one ounce of red precipitate gave 60 ounce-measures of dephlogisticated air; and, when mixed with two ounces of iron-filings, it gave about 40 ounce-measures of fixed air that were actually absorbed by water, besides a residuum that was inflammable. The same proportion was obtained when half the quantity of materials were made use of; but on using an ounce of each, only 20 ounce-measures of fixed air, including the residuum, could be got.

In considering this subject farther, it occurred to Dr Priestley, that his experiments, in which charcoal was used, lay open to an objection, that since dry wood, and imperfectly made charcoal, yield fixed air, it might be said, that all the elements of fixed air are contained in charcoal; and though this substance alone, even with the assistance of water, will not yield fixed air, this might be effected by treating it with other substances without their imparting any thing to it; especially as the inflammable air procured from charcoal by means of water, appears to contain fixed air when decomposed with the dephlogisticated kind. In order to expel all the fixed air from charcoal, he made a quantity of it from dry oak, and pounding it while hot, instantly mixed four measures of it with one of red precipitate, and, putting them into an earthen retort, got, with a heat no greater than what was sufficient to revive the mercury, a large quantity of air, half of which was fixed. Afterwards the proportion of fixed air was less, and at last no fixed air at all was obtained; but as the residuum was worse than the common atmosphere, he is thence inclined to believe, notwithstanding Mr Cavendish's experiments, that phlogisticated air may be composed of phlogiston and dephlogisticated air. In another experiment he found a better proportion of charcoal and red precipitate. This was by mixing one ounce of precipitate with the same quantity of perfect char-

111 Priestley's opinion concerning the composition of phlogisticated air.

Fixed Air. charcoal hot from the retort in which it was made. Putting these into a coated retort, he expelled from them, by a strong heat, about 30 ounce-measures of air, the whole of which was the purest fixed air, leaving only about one-fortieth part unabsorbed by water, and this almost perfectly phlogisticated.

Having recollected, that in some former experiments he had obtained fixed air from nitrous acid and charcoal, he therefore repeated the experiment with some of the same charcoal which had then been made use of; when fixed air was obtained, in the quantity sometimes only of one-fifth, and sometimes of one-half; to the formation of which he supposed the phlogisticated air produced by heating the nitrous acid must have contributed. On account of the objections, however, which might be made to the use of charcoal, he next employed *iron*, which was liable to nothing of this kind; and on mixing an ounce of iron-filings with as much charcoal, and then heating them in a glass retort, he obtained 20 ounce-measures of air, of which one-seventh remained unabsorbed by water. The residuum was of the standard of 1.52, but slightly inflammable. Repeating the experiment with half an ounce of iron filings, he got 26 ounce-measures of air, of which the first part was pretty pure, but afterwards one-tenth remained unabsorbed by water; but on mixing one ounce of precipitate with two ounces of filings, he got about 40 ounce-measures of air, of the first portions of which only one-twentieth was unabsorbed by water, though towards the conclusion the residuum was greater. In this process he got in all 36 ounce-measures of pure fixed air, completely absorbed by water, besides about other four ounce-measures, which, he supposes, might have been absorbed in receiving the air and transferring it into other vessels.

Fixed air was also produced from red pecipitate mixed with brass filings, with zinc, from turbith mineral with iron filings, and from the black powder into which mercury mixed with lead is easily converted. In this last case the Doctor supposes that the fixed air was produced from the dephlogisticated kind absorbed by the metals and the phlogiston of the lead; and this is confirmed by an observation that the fixed air always comes first in the process, when the phlogiston is most readily separated, but afterwards the produce becomes quite pure and dephlogisticated. In attempting, however, to increase the quantity of fixed air by heating this black powder in dephlogisticated air, he found only an augmentation of the quantity of dephlogisticated air, and that of the purest kind.

"Perhaps," says he, "as decisive a proof as any of the real production of fixed air from phlogiston and dephlogisticated air, may be drawn from the experiments in which I always found a quantity of it when I burned sulphur in dephlogisticated air. In one of these experiments, to which I gave particular attention, six ounce-measures and an half of the dephlogisticated air were reduced to about two ounce-measures; and one-fifth of this was fixed air. When both the vitriolic acid and fixed air produced by this operation were absorbed by water, the remainder was very pure dephlogisticated air.

"I had always concluded, that no fixed air could be procured by the decomposition of inflammable air which had been produced by mineral acids, because I had not been able to do it with that which I had got by means of vitriolic acid; but I learned from Mr Metherie, that this is peculiar to the vitriolic acid, the remains of which, diffused through the inflammable air, procured by it, he conjectures, may actually decompose the fixed air produced in the process. For, as I have hinted before, when the inflammable air is produced from iron by means of spirit of salt, there is a very perceivable quantity of fixed air when it is united with dephlogisticated air. When I decomposed these two kinds of air in equal quantities, they were reduced to about 0.5 of a measure, and of this not more than about one fortieth part was fixed air. This experiment ought, however, to be added to the other proofs of fixed air being pruduced by the union of dephlogisticated air and phlogiston.

112 Proportion of fixed air produced from dephlogisticated air.

"The last instance, which I shall mention, of the generation of fixed air from phlogiston and dephlogisticated air, is of a much more striking nature than any that I have yet recited. Having made what I call *charcoal of copper*, by passing the vapour of spirit of wine over copper when it was red-hot, I heated a piece of it in different kinds of air. In common air, observing neither increase nor decrease in the quantity, I concluded, perhaps too hastily, that no change was made in it: for when I repeated the experiment in dephlogisticated air, the charcoal burned very intensely; and when a part of it was consumed, which (like common charcoal in the same process, was done without leaving any sensible residuum) I found that no heat which I could apply afterwards, had any farther effect on what was left of the charcoal. Concluding, therefore, that some change must be made in the quality of the air, I examined it, and found about nine-tenths to be the purest fixed air; and the residuum was such as would have been made by separating the absolutely pure part of the dephlogisticated air, leaving all the impurities behind.—Having ascertained this fact, I repeated the experiment, weighing the piece of charcoal very carefully before and after the process; and then found, that by the loss of one grain of charcoal, I reduced four ounce measures of dephlogisticated air till one-ninth only remained unabsorbed by water; and again, with the loss of one grain and an half of the charcoal, I reduced six and an half-measures of dephlogisticated air till five and an half-measures were pure fixed air. In this process there was a diminution of bulk after the experiment, as might have been expected from the change of the air into one of a heavier kind by means of a substance or principle that could not add much to the weight of it. In one of the experiments, 4.3 ounce-measures of dephlogisticated air were reduced about one-thirtieth part of the whole; and in this case, when the fixed air was separated by water, there was a residuum of 0.75 of a measure of the standard of 1.0, whereas the dephlogisticated air, before the experiment, had been of the standard of 0.2.

"That dephlogisticated air actually enters into the composition of the fixed air, in this experiment, is evident from the weight of the latter, which far exceeds that of the charcoal dispersed in the process. For, in this last experiment, the weight of the fixed air produced was 4.95 grains. Consequently, supposing the charcoal to be wholly phlogiston, as it is very nearly so, fixed air may be said to consist of 3.45 parts of dephlogisticated

gisticated air, and 1.5 of phlogiston; so that the dephlogisticated air is more than three times the proportion of phlogiston in it.—I must not conclude, however, without observing, that, in one experiment, I never failed to produce fixed air; though it is not easy to see how *one* of its supposed elements, viz. dephlogisticated air, could enter into it. This is by heating iron in vitriolic acid air. In one of these experiments, four ounce-measures of the vitriolic acid air were reduced to 0.65 of an ounce-measure; and of the quantity lost three and an half measures were fixed air absorbed by lime-water, and the remainder weakly inflammable."

113 Effects of the electric spark on fixed air.

Fixed air, even when pure and unmixed, is remarkably altered by the electric spark, part of it being thus rendered immiscible in water. Dr Priestley, having taken the electric spark for about two hours in a small quantity of fixed air confined by mercury, found, that after the operation, one-fourth of it remained immiscible with water; though, before it, only one-thirtieth part had remained unabsorbed. The inside of the tube had become very black; which, in other experiments of a similar kind with vitriolic acid air, he had observed to arise from the adhesion of a small quantity of mercury supersaturated with phlogiston. In another experiment, in which the spark was taken an hour and ten minutes in about half an ounce-measure of fixed air, one-fifth remained unabsorbed, and the standard of the residuum was 0.9; though, before the operation, only one-thirtieth part had been absorbed, and the standard of the residuum was 1.0. In this experiment, also, he observed, that the air was increased about a twentieth part. On taking the electric spark an hour in half an ounce of fixed air, as much residuum was left as had remained in five times the quantity of the same fixed air in which no spark had been taken. This residuum was also much purer than that of the original fixed air, the standard being 0.8; whereas that of the original fixed air had been, as before, 1.0. On repeating the experiment, he found the residuum still greater, but equally pure; and, in this case, a good quantity of black matter was observed adhering to the tube. Having taken the spark in a small tube containing $\frac{1}{15}$th of an ounce-measure of fixed air, the inside of the tube was clouded with black matter, and in the bottom was a small quantity of yellowish matter resembling sulphur; the residuum was between one-fourth and one-fifth of the whole, and less pure than formerly. This circumstance he also supposes to be a proof that fixed air may be composed of phlogiston and dephlogisticated air. Pursuing this experiment, by taking the electric spark three hours in a small quantity of fixed air, he observed that it was first increased, and then diminished about one-eighth of the whole; the inside of the tube being very black on the upper part, and below the mercury very yellow, for the space of a quarter of an inch all round the tube; but this space had been above the mercury in the beginning of the operation. One-third of the air remained unabsorbed by water; but so impure, that the standard of it was 1.8, or almost completely phlogisticated.—Varying the process by using water impregnated with fixed air instead of mercury, the quantity of air was much augmented by that which came from the water; but thus the far greater part of it was incapable of being absorbed by lime-water; and on this occasion he observed, that water impregnated with fixed air is a much worse conductor of electricity than the same fluid impregnated with mineral acids. On still varying the circumstances of the experiment, by using common water instead of that which had absorbed fixed air, he found that the quality of the residuum was evidently better than that of the original fixed air.

114 Experiment in favour of Priestley's hypothesis concerning the composition of phlogisticated air.

115 Effects of a strong heat on fixed air.

In order to discover whether the heat or light of the electric spark were the circumstances which effected the change, the Doctor threw a strong light, by means of a lens, for some hours, on a quantity of pounded glass confined in some fixed air; but though the volume of residuum was thus somewhat increased, yet as it was of the same quality with common air he suspected that it might be only that portion which had been introduced among the particles of the glass. The quantity of air was increased after the operation. With glass-house sand made very hot, the quantity of air was likewise increased; but the experiment was not more satisfactory than the former. Heated bits of crucibles increased the quantity of residuum in the proportion of 10 to 6.6; but the quality was injured either directly by a comparison with nitrous air or by producing a larger quantity of residuum equally bad. By heating iron, however, in fixed air, part of it was evidently converted into phlogisticated air. On heating turnings of malleable iron for some time in fixed air, one-tenth part of it was rendered immiscible with water; and on repeating the process with the remainder, there was a residuum of one-fourth of the whole. There was also a small addition to the quantity of air after the first part of the process, but none after the second; nor could he, after a third and fourth process, render more than one-fourth immiscible with water. In two experiments, the residuum was inflammable, and burned with a blue flame.

116 Quantity of fixed air expelled from different substances.

With regard to the quantity of fixed air which may be expelled from different substances, Dr Priestley observes, that from seven ounces of whiting, the purest calcareous substance we are acquainted with, he expelled by heat 630 ounce-measures of air; by which means the whiting was reduced to four ounces. One third of this was somewhat phlogisticated; the standard being 1.36 and 1.38. Repeating the experiment, he obtained 440 ounce-measures of air from six ounces of whiting; about one-half of which was fixed air, and the remainder of the standard of 1.4. On moistening some calcined whiting with water impregnated with vitriolic acid air, he obtained 90 ounce-measures; of which the first portions were three-fourths fixed air, and the standard of the residuum 1.5; the latter had less fixed air, and the standard of the residuum was 1.44. The whiting was rendered black and hard, but became soft and white with spirit of salt. Three ounces and a quarter of lime fallen in the air, yielded 375 ounce-measures; of which about one-fifth was fixed air, and the standard of the residuum 1.4. Four ounces of white lead had yielded 240 measures of air when the retort melted. The residuum of the first process was one-third, the standard 1.36; and of the last the standard was 1.28, that with the common atmosphere being 1.23. Two ounces and three quarters of wood-ashes yielded, in a very strong heat, 430 ounce-measures of air; of the first portion of which one-tenth, of the second one-third, and of the third one-half, was fixed air

air. The standard of the residuum of the first portion was 1.6, and of the second 1.7. It extinguished a candle; so that the air came properly from the ashes, and not from any remaining particles of the charcoal mixed with them. After the process, the ashes weighed 839 grains; but by exposure to the air for one day, the weight was increased to 842 grains; and, perhaps with more heat than before, yielded 50 ounce-measures of air; of which about one-eighth was fixed air, and the standard of the residuum 1.38 and 1.41. A candle burned in this residuum, and the ashes were reduced to 739¼ grains. Two ounce-measures of Homberg's pyrophorus burned in the open air, and then distilled in a retort, yielded 144 ounce-measures of air; of which one-half at first was fixed air, but at the last very little. The residuum of the first portion extinguished a candle, but that of the last burned with a blue lambent flame. The standards of both with nitrous air were about 1.8. The pyrophorus was then kept two days in the retort, with the mouth immersed in mercury; after which, on being taken out, it burned as strong as ever. Immediately before the burning, it weighed 428 grains; immediately after it, 449; but being spread thin and exposed to the atmosphere for a night, the weight was increased to 828 grains; though, on being well dried, it was again reduced to 486. Subjecting it to a greater heat than before, the matter yielded 110 ounce-measures of air; the first portions of which were half fixed air, but the last contained very little, and burned with a blue lambent flame. It was then reduced to 396 grains. The experiment was then repeated with a quantity of pyrophorus, which would not take fire in the open air; and on heating this substance in an earthen retort, five-sevenths of the first part of the produce was fixed air: but this proportion gradually diminished; till at last nine-tenths of the whole was inflammable air, burning with a lambent blue flame. This inflammable air being decomposed with an equal quantity of dephlogisticated air, yielded 0.86 of a measure of fixed air. Another quantity of pyrophorus, which burned very well, and which by exposure to the atmosphere had gained 132 grains, being again exposed to heat in an earthen retort, gave 180 ounce-measures of air; three-sevenths of the first portion of which was fixed, and the rest phlogisticated air; but afterwards only one-half was fixed and the rest inflammable, burning with a lambent blue flame; and at last it was wholly inflammable. This pyrophorus took fire again after being poured out of the retort, but not without the assistance of external heat. It had been red-hot through the whole mass at the first burning, and the surface was covered with white ashes; but all the inside was as black as ever it had been. Four ounces of dry ox-blood yielded 1200 ounce-measures of air, and it was conjectured that not less than 200 measures had escaped. It contained no fixed air. The first portion burned with a large lambent white flame, the middle portion fainter, and the last was hardly inflammable at all. The remaining coal weighed 255 grains, and was a good conductor of electricity.

Sect. VI. *Inflammable Air.*

We owe the knowledge of the existence, and of some remarkable properties, of this air, to Mr Cavendish, by whom they were first published in 1767. Its effects, however, had long before been fatally experienced by miners; in whose subterraneous habitations it is often collected in such quantities as to produce the most dreadful effects. It is produced in abundance from putrid animal and vegetable substances; and, in general, by all those which part with their phlogiston easily. Being much lighter than common air, it always rises to the top of those places where it is generated; so that it cannot be confined except in some vaulted place, but always strives to ascend and mix with the atmosphere. By itself it is very noxious, and will instantly put an end to animal life; but when mixed with atmospherical air, may be breathed in much greater quantity than fixed air. Its great inflammability in this state, however, renders it very dangerous to bring any lights, or even to strike a flint with steel, in those places where it abounds. But this only takes place when the inflammable air is mixed with common atmospherical or with dephlogisticated air; in which case, the explosion is much more violent than the former; for pure inflammable air extinguishes flame as effectually as fixed or phlogisticated air.

117 Inflammable air produced in mines from putrid waters, &c.

Besides the subterraneous places already mentioned, this kind of air is found in ditches; over the surface of putrid waters, out of which it escapes; in burying-places; in houses of office where putrid animal and vegetable matters are accumulated; and may, by standing or boiling, be extracted from the waters of most lakes and rivers, especially those in which great quantities of fermenting and putrefying matters are thrown: and as putrefaction thus seems to be the principal source of inflammable air, it thence happens, that much more of it is produced in warm than in cold climates. In those countries, we are informed by Dr Franklin, that if the mud at the bottom of a pond be well stirred, and a lighted candle brought near to the surface of the water immediately after, a flame will instantly spread a considerable way over the water, from the accession of the inflammable air, affording a very curious spectacle in the night-time. In colder climates, the generation of inflammable air is not so plentiful as to produce this phenomenon; nevertheless Mr Cavallo informs us, that it may be plentifully procured in the following manner, in all the ponds about London. "Fill a wide-mouthed bottle with the water of the pond, and keep it inverted therein; then, with a stick, stir the mud at the bottom of the pond, just under the inverted bottle, so as to let the bubbles of air which come out of it enter into the bottle; which air is inflammable. When by thus stirring the mud in various places, and catching the air in the bottle until this is filled, a cork or glass stopper must be put over it whilst standing in water; and then the bottle may be taken home, in order to examine the contained inflammable fluid at leisure."

118 Great quantities produced in hot climates.

119 Mr Cavallo's method of collecting inflammable air from ponds.

The great quantity of inflammable air produced in warm climates has given occasion to some philosophers to suppose, that it may possibly have some share in producing certain atmospherical meteors. The weak lightnings without any explosion, which are sometimes perceived near the horizon in serene weather, are by them conjectured to proceed from inflammable air fired by electric explosions in the atmosphere. Mr Volta supposes that the *ignes fatui* are occasioned by the inflammable air which proceeds from marshy grounds,

120 Meteors thought to proceed from it.

Inflammable Air.

grounds, and is set on fire by electric sparks; but these phenomena can be accounted for in a more probable manner from the action of the electric fluid itself.

This kind of air is more common than any of the other noxious airs; for there is hardly any inflammable substance on earth, out of which it may not be extracted by one means or other. The fluids, however, which go by the general name of *inflammable air*, have scarce any other property in common to them all, besides those of inflammability, and being specifically lighter than the common atmospherical air. In other respects, the differences between them are very considerable.

121 Differences among inflammable airs.

The smell, weight, power of burning, of preserving their properties, and the phenomena attending their combustion, are by no means the same in them all; some burning in an explosive manner; others quietly, and with a lambent flame of a white or blue colour. It is, however, necessary to make a proper distinction between an inflammable elastic fluid or inflammable gas, which may be properly called so, and that which is evidently made by combining an inflammable substance with common air; which being easily separable from the air, leaves that fluid in the state it was before. Thus a drop of ether, put into a quantity of common air, mixes itself with it, and takes fire on the approach of flame, like a mixture of inflammable and common air; but if the air to which ether is added be washed in water, the latter is soon separated from it. Common air becomes also inflammable by being transmitted through several essential oils; and thus the air contiguous to the plant called *fraxinella* becomes inflammable in calm and hot weather, by the emission of its inflammable air.

122 Extracted from various substances by heat.

By heat alone, a considerable quantity of this kind of air may be extracted from most inflammable substances, and even from some of the metals. Dr Hales obtained inflammable air by simply distilling wax, pitch, amber, coals, pease, and oyster shells; and Mr Fontana informs us, that he obtained a considerable quantity of inflammable air from spathose iron, by the action of fire only applied to it in a matrass. Dr Priestley, however obtained it from a vast number of other substances, by distilling them in a gun-barrel; to the extremity of which was luted a tobacco pipe, or small glass tube, with a flaccid bladder tied on the end. He observes, that the heat must be suddenly applied, in order to get a considerable quantity of air from these substances.

123 More air procured by a sudden than gradual heat.

"Notwithstanding (says he) the same care be taken in luting, and in every other respect, six, or even ten, times more air may be got by a sudden heat than by a slow one, though the heat that is last applied be as intense as that which was applied suddenly. A bit of dry oak, weighing about twelve grains, will generally yield a sheep's bladder full of inflammable air with a brisk heat, when it will only yield two or three ounce-measures if the same heat be applied gradually." When he wanted to extract inflammable air from metals, a glass was used, the focus of which afforded a more intense heat than any furnace he could apply: and in this way he obtained inflammable air from several metals; as iron, brass, and tin; but with the metallic calces he had no success.

In the infancy of his experiments, and even after very considerable practice, the Doctor imagined, that the inflammable air produced in this way came only from the metal, without attending to the share which water had in the production. Some late experiments of Mr Lavoisier, however, showed, that water had a great share in the production of inflammable air; insomuch that it gave occasion to a supposition, that the water was the only source from whence it was derived. This mistake, however, was detected by Dr Priestley; who, by his numerous and accurate experiments, seems in a manner to have exhausted the subject.

124 How procured from water and other fluid and solid substances.

The method which Mr Lavoisier had followed, was to send the steam of boiling water through a red-hot iron tube; in doing which, the intense heat acquired by the water occasioned the production of a great quantity of inflammable air. Dr Priestley repeated his experiments not only with water, but with other fluids. Sending the vapour of two ounces of spirit of wine through a red-hot earthen tube, he obtained 1900 ounce-measures of inflammable air, which burned with a white lambent flame. It contained no fixed air; and 30 ounce-measures of it weighed eight grains less than an equal quantity of common air. He collected also 0.35 of an ounce-measure of water. In this experiment, the weight of the water collected was 168 grains, of the inflammable air 633 grains, and that of the spirit of wine originally was 821 grains, so that as little was lost in the process as could be expected.—Repeating the experiment with vitriolic ether, an ounce of it treated in the same manner in an earthen tube almost filled with pieces of broken earthen retorts and crucibles, one-tenth part of an ounce of water was collected, and 740 ounce-measures of inflammable air were procured, without any mixture of fixed air, burning with a white lambent flame like that of wood, and not exploding with dephlogisticated air. Twenty-nine ounce-measures of this weighed five grains less than an equal quantity of common air. Vapour of spirit of turpentine yielded inflammable air mixed with much black smoke, which soon collected on the surface of the water in the receiver. The smell of this air was exceedingly offensive, and its flame was much less luminous than that of the former. Its specific gravity was the same with that of the air procured from spirit of wine. Olive oil yielded a considerable quantity of air on being mixed with calcined whiting; the first portions burning with a large white flame, and the last with a lambent blue one.

In extracting air from solid substances, the steam of water was always necessary; and thus inflammable air was produced from a great number of different ones. From sulphur treated in this manner in an earthen tube, inflammable air was obtained of a nature similar to that from oil of vitriol and iron. From arsenic, the produce was one-seventh of fixed air; but all the rest strongly inflammable, with a smell scarcely distinguishable from that of phosphorus. Twenty ounce-measures of this air weighed $4\frac{1}{4}$ grains less than an equal quantity of common air. Both these experiments, however, were very troublesome, on account of the volatility of the matters, which sublimed and choaked up the tubes. From two ounces of the scales of iron or *fining cinder*, which he has found to be the same thing, Dr Priestley obtained 580 ounce-measures of air; one-tenth of the first part of which was fixed air, but afterwards it was all inflammable.

Forty

Inflammable Air.

Forty ounce measures of this air weighed two grains more than an equal quantity of common air. From charcoal exposed to the red-hot steam of water, inflammable air was procured in great quantities. From ninety-four grains of perfect charcoal, that is, prepared with a strong heat so as to expel all fixed air from it, and 240 ounces of water, 840 ounce-measures of air were obtained, one-fifth part of which was fixed air; and the inflammable part appeared likewise, by decomposition, to have a quantity of fixed air intimately combined with it.—Three ounces of bones burnt black, and treated in this manner in a copper tube, yielded 840 ounce-measures of air; the water expended being 288 grains, and the bones losing 110 grains of their weight. This air, he observes, differs considerably from that of any other kind of inflammable air; being in several respects a medium betwixt the air procured from charcoal and that from iron. It contains about one-fourth of its bulk of uncombined fixed air, but not quite one-tenth intimately combined with the remainder. The water that came over was blue, and pretty strongly alkaline; owing to the volatile alkali not having been totally expelled by the heat which had reduced the bones to blackness.

A variety of substances, said not to contain any phlogiston, were subjected to the same process, but without yielding any inflammable air. The experiments with iron, however, were the most satisfactory as being subject to less variation than those with charcoal; and clearly evincing, that the air in the process does not come from the water alone, but from the iron also; or, as Dr Priestley says, "only from the iron; the weight of water expended, deducting the weight of air produced, being found in the addition of weight in the iron as nearly as could be expected in experiments of this kind. And though the inflammable air procured in the process is between one-third and one-half more than can be procured from iron by solution in acids, the reason may be, that much phlogiston is retained in the solutions; and therefore much more may be expelled from iron when pure water, without any acid, takes place of it. The produce of air, and likewise the addition of weight gained by the iron, are also much more easily ascertained in these experiments than the quantity of water expended in them; on account of the great length of the vessels used in the process, and the different quantities that may perhaps be retained in the worm of the tube.

125 Proportions of inflammable air obtained from iron by means of steam.

The following are the results of some of the Doctor's experiments.——Two hundred and sixty-seven grains, added to the weight of a quantity of iron, produced a loss of 336 grains of water, and an emission of 840 ounce-measures of air; and in another experiment, 140 grains added to the weight of the iron produced a loss of 240 grains of water, and the emission of 420 ounce-measures of air. "The inflammable air produced in this manner (says he) is of the lightest kind, and free from that very offensive smell which is generally occasioned by the rapid solution of metals in oil of vitriol; and it is extricated in as little time in this way as it is possible to do it by any mode of solution. The following experiment was made with a view to ascertain the quantity of inflammable air that may be procured in this manner from any given quantity of iron. Nine hundred and sixty grains of iron, when dissolved in acids, will yield about 800 ounce-measures of air; but, treated in this manner, it yielded 1054 measures, and then the iron had gained 329 grains in weight (A)."

126 Of the constituent principles of inflammable air.

Inflammable air having been at first produced only from metals by means of acids, it was then supposed that part of the acid necessarily enters into its composition; but this hypothesis is now found to be ill grounded. "That no acid (says Dr Priestley), is necessarily contained, or at least in any sensible quantity,

127 No acid contained in it.

either in inflammable air, though produced by means of acids, or in the dephlogisticated air of the atmosphere, is evident from the following experiment, which I made with the greatest care: Taking a bason which contained a small quantity of water tinged blue with the juice of turnsole, I placed it in a bent tube of glass, which came from a vessel containing iron and diluted oil of vitriol; and lighting the current of inflammable air as it issued from this tube, so that it burned exactly like a candle, I placed over it an inverted glass jar, so that the mouth of it was plunged in the liquor. Under this jar the inflammable air burned as long as it could; and when extinguished for want of more pure air, I suffered the liquor to rise as high as it could within the jar, that it might imbibe whatever should be deposited from the decomposition of either of the two kinds of air. I then took off the jar, changed the air in it, and lighting the stream of inflammable air, replaced the jar as before. This I did till I had decomposed a very great quantity of the two kinds of air, without perceiving the least change in the colour of the liquor, which must have been the case if any acid had entered as a necessary constituent part into either of the two kinds of air. I also found no acid whatever in the water, which was procured by keeping a stream of inflammable air constantly burning in a large glass balloon, through which the air could circulate, so that the flame did not go out. Neither was there any acid produced in the decomposition of inflammable and dephlogisticated air in a strong close glass vessel.

"With respect to inflammable air, I have observed, that when sufficient care is taken to free it from any acid vapour that may be accidentally contained in it, it is not in the smallest degree affected by a mixture of alkaline air. On the whole, therefore, I have at present no doubt, but that pure inflammable air, though it certainly contains *water*, does not necessarily contain any

(A) In these experiments, the Doctor seems not to have supposed that any particular kind of water was necessary for this production of inflammable air: but in the Memoirs of the Philosophical Society at Haerlem, it is asserted by Dr. Deiman and M. Paets Van Troostwyk, that the experiment will not succeed when boiled or distilled water, or any other than that containing fixed air, is made use of; and to this air they attribute the calcination of the iron, and production of inflammable air. This assertion, however, is contrary to what we find related by Mr Kirwan. See n° 138.

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any acid: yet an acid vapour may be easily diffused through it, and may perhaps in many cases be obstinately retained by it, as no kind of air seems to be capable of so great a variety of impregnations as inflammable air is."

128 Water necessary to its production.

Mr Cavendish first perceived the necessity of moisture to the production of inflammable air; but it was not until after making several experiments that Dr Priestley could adopt the same idea. He had observed some very remarkable circumstances relating to the production of inflammable air from charcoal, by which he was induced to suppose that the former was pure phlogiston in a volatile state without any moisture whatever. The Doctor observes, that "charcoal is generally said to be indestructible, except by a red heat in contact with air. But I find (says he), that it is perfectly destructible, or decomposed, *in vacuo*, and, by the heat of a burning lens, almost convertible into inflammable air; so that nothing remains besides an exceedingly small quantity of white ashes, which are seldom visible, except when in very small particles they happen to cross the sun-beams as they fly about the receiver. It would be be impossible to collect or weigh them; but according to appearance, the ashes thus produced, from many pounds of wood, could not be supposed to weigh a grain. The great weight of ashes produced by burning wood in open air arises from what is attracted by them from the air. The air which I get in this manner is wholly inflammable, without the least particle of fixed air in it. But in order to this, the charcoal must be perfectly well made, or with such a heat as would expel all the fixed air which the wood contains; and it must be continued till it yields inflammable air only, which in an earthen retort, is soon produced.

129 Charcoal totally convertible into inflammable Air.

130 Weight of ashes derived from the air.

"Wood or charcoal is even perfectly destructible, that is, resolvable into inflammable air, in a good earthen retort, and a fire that would about melt iron. In these circumstances, after all the fixed air had come over, I several times continued the process during a whole day; in all which time inflammable air has been produced equally, and without any appearance of a termination. Nor did I wonder at this, after seeing it wholly vanish into inflammable air *in vacuo*. A quantity of charcoal made from oak, and weighing about an ounce, generally gave me about five ounce-measures of inflammable air in twelve minutes."

131 Experiment showing the necessity of water to the production of inflammable air.

Although from these experiments it did not appear that water was in any ways essentially necessary to the production of this kind of inflammable air, it appeared manifestly to be so in the following: "At the time (says he) when I dispersed any quantity of charcoal with a burning lens *in vacuo*, and thereby filled my receiver with nothing but inflammable air, I had no suspicion that the wet leather on which my receiver stood could have any influence in the case, while the piece of charcoal was subject to the intense heat of the lens, and placed several inches above the leather. I had also procured inflammable air from charcoal in a glazed earthen retort for two whole days successively, during which it continued to yield it without intermission. Also iron-filings in a gun-barrel, and a gun-barrel itself, had always given inflammable air whenever I tried the experiment. These circumstances, however, deceived me, and perhaps would have deceived any other person; for I did not know, and could not have believed, the powerful attraction between water and charcoal or iron, when the latter are intensely hot. They will find, and attract it, in the midst of the hottest fire, and through any pores that may be left open in a retort; and iron filings are seldom so dry as not to have as much moisture adhering to them as is capable of enabling them to give a considerable quantity of inflammable air. But my attention being now fully awakened to the subject, I presently found that the circumstances abovementioned had actually misled me; I mean with respect to the conclusion which I drew from the experiments, and not with respect to the experiments themselves, every one of which will, I doubt not, be found to answer, when properly tried.

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132 Excessive attraction betwixt charcoal, or iron and water.

"Being thus apprised of the influence of unperceived moisture in the production of inflammable air, and willing to ascertain it to my perfect satisfaction, I began with filling a gun-barrel with iron filings in their common state, without taking any particular precaution to dry them, and I found that they gave air as they had been used to do, and continued to do so many hours: I even got ten ounce-measures of inflammable air from two ounces of iron filings in a coated glass retort: At length, however, the production of inflammable air from the gun-barrel ceased; but, on putting water to it, the air was produced again; and a few repetitions of the experiment convinced me that I had been too precipitate in concluding that inflammable air is pure phlogiston. I then repeated the experiment with the charcoal, making the receiver, the stand on which I placed the charcoal, and the charcoal itself, as dry and hot as possible, and using cement instead of wet leather, in order to exclude the air. In these circumstances I was not able, with the advantage of a good sun and an excellent burning lens, to decompose quite so much as two grains of the piece of charcoal which gave me ten ounce-measures of inflammable air; and this, I imagine, was effected by means of so much moisture as was deposited from the air in its state of rarefaction, and before it could be drawn from the receiver. To the production of this kind of inflammable air, therefore, I was now convinced that water is as essential as to that from iron."

133 Inflammable air is not pure phlogiston.

134 Priestley's analysis of different kinds of inflammable air.

In his analysis of different kinds of inflammable air, the Doctor observes, that the difference most commonly perceived is, that some of them burn with a lambent flame, sometimes white, sometimes yellow, and sometimes blue; while another kind always burns with an explosion, making more or less of a report when a lighted candle is dipped into a jar filled with it. The inflammable air extracted from metals by means of acids is of this last kind; and that from wood, coal, or other inflammable substances by means of heat, belongs to the former. It has also been observed, that these kinds of inflammable air have different specific gravities; the, purest, or that which is extracted from iron, &c. being about ten times as light as common air; but some of the other kinds not more than twice as light (A).

This difference was for some time attributed to a quantity

(A) Here the Doctor's calculation differs somewhat from that of Mr Kirwan; who, in his Treatise on Phlogiston,

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quantity of fixed air intimately combined with the heavier kinds, so that it could not be discovered by lime-water, while the lightest contained no fixed air at all. In order to ascertain this point, he had recourse to decomposition; which was performed by mixing with the inflammable air to be tried an equal quantity of common or dephlogisticated air, and then confining them in a strong glass vessel previously filled either with water or mercury; making afterwards an electric spark in some part of the mixture by means of wires inserted through the sides of the vessel, and nearly meeting within it. Thus he supposed that he might be able to determine the quantity of *combined* fixed air, and likewise the relative quantity of phlogiston contained in each of them. The former appeared by washing the air with lime-water after the explosion, and observing how much of them was absorbed; and the latter by examining the residuum with the test of nitrous air, and observing the purity of it. Finding, however, that, in some cases, more fixed air was found after the explosion than could have been *contained* in the inflammable air, he was thence led to observe the *generation* of fixed air from the princples mentioned in the last section.

135 Fixed air generated in the decomposition of inflammable air.

In prosecuting this subject, it was found, that one measure of inflammable air produced by steam from metals, and one of dephlogisticated air, such as by mixture with two measures of nitrous air was reduced to 0.72 of a measure, were reduced by explosion to 0.6 of a measure; the residuum, by an equal quantity of nitrous air, was reduced to 0.87. With the same dephlogisticated air, the inflammable air from fining-cinder and charcoal was reduced only to 1.85 of a measure; but by washing in lime-water, to 1.2. The residuum examined by nitrous air appeared to be of the standard of 0.9. In another process, the diminution after the explosion was to 1.55, and that after washing in lime-water to 0.65, of a measure; in a third, by explosion to 1.6, and by washing to 0.66; and in a fourth, the first diminution was to 1.6, and the second to 0.9. In this last experiment there was a generation of an entire measure of fixed air; and that this had not been contained originally in any latent state in the original fluid, was evident from the specific gravity of the inflammable air made use of. This, indeed, was one of the heaviest kinds of the fluid: but 40 ounce-measures of it weighed only two grains more than an equal bulk of common air; whereas, had all the fixed air found in the residuum been *contained* in the original air, it must have been at least one half heavier. "Indeed (says the Doctor) if any quantity of inflammable air, of about the same specific gravity with common air (which is the case with that species of it I am now considering), yield so much as seven-tenths of its bulk of fixed air in consequence of its explosion with dephlogisticated air, it is a proof that at least part of that fixed air was generated in the process, because seven-tenths of such fixed air would weigh more than the whole measure of inflammable air."

Equal parts of dephlogisticated air and the inflammable kind produced from spirit of wine, were reduced to one measure, and by washing in lime-water to 0.6 of a measure. The standard of the residuum was 1.7.—In another experiment, in which the vapour of the spirit of wine had passed through a tube filled with bits of crucibles, the first diminution was to 1.6, the second to 1.4, and the standard of the residuum was to 1.84: but in a third, the first diminution was to 1.2, the second to 0.9.—Air procured by steam from red-hot platina was reduced to 0.72 of a measure, and the standard of the residuum was 0.9. It contained no fixed air.—Air from brimstone, with an equal part of dephlogisticated air, was diminished to 0.6, and no fixed air was found in the residuum. Its standard was 0.95.—With inflammable air from arsenic, the first reduction was to 1.15, the second to 0.95. The standard was 0.82.—With the inflammable air procured by a decomposition of alkaline air, the diminution by explosion was to 0.96, and no fixed air was contained in the residuum; the standard of which was 0.8—Inflammable air from ether resembles that from spirit of wine. The first diminution was to 1.36, the second to 1.2; and the standard was 1.9.

Inflammable air procured by means of steam from charcoal of metals produces a considerable quantity of fixed air; the first diminution being to 1.12, the second to 0.8, and the standard of the residuum 1.9. This analysis was of the first portion that came over, the second was somewhat different; the first diminution being to 1.0, the second to 0.75, and the standard of the residuum 1.9.—From *coak*, or the charcoal of pitcoal, the first diminution was to 1.15, the second to 0.95, and the standard 1.9; but the dephlogisticated air in this experiment was by no means pure.

With inflammable air from spirit of turpentine, the first diminution was to 1.7, the second to 1.6, and the standard 1.9—From bones, the first diminution was to 0.67, the second to 0.58; the standard 1.47.—From common charcoal, the first diminution was to 1.5, the second to 0.74, and the standard 1.7. In another experiment, the first diminution was to 0.82, the second to 0.63, and the standard of the residuum 1.37.

Inflammable air procured by distilling some rich mould in a gun-barrel had a very offensive smell, like that procured from putrid vegetables; it contained one-twentieth part of uncombined fixed air. When this was separated from it, and the remainder decomposed with dephlogisticated air, the first diminution was to 1.4, the second to 0.67, and the standard of the residuum was 0.6.—The air procured from cast-iron has likewise a peculiarly offensive smell; and, on this account, the Doctor imagined, that it might contain more phlogiston than common inflammable air, so as to absorb more dephlogisticated air than the other. But this conjecture did not appear to be well founded; for on exploding it with dephlogisticated air in the proportions

giston, informs us, that in his experiments he used "inflammable air extracted from clean newly-made filings of soft iron, in the temperature of 59°, by vitriolic acid whose specific gravity was 1.0973, and obtained over mercury, having very little smell, and what it had being very unlike the usual smell of inflammable air."—The weight of this air, when the barometer stood at 29.9, and the thermometer at 60°, was found to be to that of common air as 84.3 to 1000; and, consequently, near 12 times lighter.

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proportions already mentioned, the diminution was the same as with inflammable air produced from the malleable kind, viz. 1.56.

In these experiments, it seemed evident, that at least part of the fixed air found after the explosion was produced by its means; but the following seem no less convincing proofs, that fixed air may be converted into the inflammable kind, or at least that the elements of fixed air may remain in inflammable air in such a manner as to be imperceptible. On heating in an earthern retort a quantity of slaked lime, which had long been kept close corked in a bottle, it gave air, of which one-fifth was generally fixed air; but in the gun-barrel the same lime yielded no fixed air at all, but a great quantity of inflammable air of the explosive kind, like that which is got from iron alone by means of water. As this total disappearance of the fixed air appeared extraordinary, the Doctor was induced to repeat it several times with all possible care; and the following was the result of his experiments: Three ounces of slaked lime, which had for some time been exposed to the open air, heated in an earthen tube, yielded 14 ounce-measures of air, of which only two and an half remained unabsorbed by water; the residuum was slightly inflammable, but not perfectly phlogisticated. Three ounces of the same lime, heated in a gun-barrel, gave 20 ounce-measures of air, all of which was inflammable, and no part fixed. It was expected, however, that the fixed air would have appeared on the decomposition of this inflammable air with the dephlogisticated kind: but after this process, it appeared to be exactly such inflammable air as is procured from metals by the mineral acids, or by steam; the diminution of the two kinds of air being exactly the same: and tho' some fixed air was found in the residuum, it was no more than is usually met with in the decomposition of inflammable air procured by means of spirit of salt.— Supposing that the two kinds of air might incorporate, when one of them was generated within the other, a gun-barrel was filled with fixed air, and the closed end of it put into a hot fire. Inflammable air was instantly produced; but when the fixed air was separated from it, it burned like inflammable air with which no other kind had ever been mixed.

136 Fixed air convertible into inflammable air.

On heating iron-turnings in five ounce-measures of fixed air, the quantity of it was increased about one ounce-measure, and there remained one and three-fourths unabsorbed by water. The experiment was repeated with the same result; and it was farther observed, that though the inflammable air procured in this manner did not appear by the test of lime-water to contain any fixed air, yet when it was decomposed by firing it with an equal quantity of dephlogisticated air, the residuum contained one-third of fixed air. The diminution was to 1.45. Hence the Doctor conjectures, that though, in some cases, the fixed air appears to be *generated* by the decomposition of dephlogisticated and inflammable air, yet that inflammable air, when thus produced in contact with fixed air, may *combine* with it, so as to be properly *contained* in it, and in such a manner that it cannot be discovered by lime water.

Inflammable air, when produced in the driest way possible, is exceedingly light, as has been already observed: but Dr Priestley has found, that by standing on water, a very considerable increase is made in its specific gravity; so that from being ten or twelve times lighter than atmospherical air, it soon becomes only seven times lighter. This great propensity to unite with water is also taken notice of by Mr Kirwan; who tells us, that the bulk of inflammable air obtained over water with the assistance of heat towards the end, was one-eighth greater than when produced over mercury; but that the weight of it in the former case was only eight or nine times less than common air.—— "From 85 cubic inches of inflammable air obtained over water, I extracted," says he, "by oil of vitriol exposed to it for 55 hours, two grains of water; and, though undoubtedly there is an error in all these experiments, yet there can be little doubt but this inflammable air contained one-half its weight of water. The inflammable air, by the subtraction of its water, lost its smell, but continued as inflammable as ever; and therefore there is no reason to think that it was decomposed, or that water is any way essential to it."

137 Great propensity of inflammable air to unite with water.

The conclusion is directly contrary to that of Dr Priestley, that *water* is an essential ingredient in the composition of inflammable air; nor do the experiments of the latter, already recited, seem to have had any weight with him, as he concludes his Treatise on Phlogiston in these words. "To the proofs I have heretofore given, that inflammable air and phlogiston are the same substance, just as ice and the vapour of water are called the same substance, no objection of any weight has since been made. Some have thought that I should have included the matter of heat or elementary fire in the definition of inflammable air: but as fire is contained in all corporeal substances, it is perfectly needless, except where bodies differ in the quantity of it they contain; and in this respect I expresly mentioned its difference with phlogiston to consist.— Others, attending to the quantity of water contained in inflammable air, have supposed it to be an essential ingredient in the composition of this air, and have called it *phlogisticated water;* but they may as well suppose water to be an essential ingredient in common air, or fixed air, and call this last *acidulated water:* for inflammable air, equally as other airs, may be deprived of its water without any limitation, and yet preserve all its properties unaltered; which shows the presence of water to be no way essential to it. Lastly, others have thought, that it essentially requires an acid or an alkali, or some saline substance, for its basis; as if there were any more repugnance in the nature of things that phlogiston should exist in an aërial state without any basis, than marine air, alkaline air, or dephlogisticated air; when it is evident, that an aërial state requires no more than a certain proportion of latent heat: but the production of inflammable air from iron by means of distilled water, without any acid or salt, has effectually done away any suspicion of that sort."

138 Mr Kirwan's conclusion concerning the principles of inflammable air.

On the other hand, Dr Priestley informs us, that "inflammable air seems now to consist of water and inflammable air: which, however, seems extraordinary, as the two substances are hereby made to involve each other; one of the constituent parts of water being inflammable air, and one of the constituent parts of inflammable air being water; and therefore, if the experiments would favour it (but I do not see that they do so),

139 Dr Priestleys conclusion.

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so), it would be more natural to suppose, that water, like fixed air, consists of phlogiston and dephlogisticated air, in some different mode of combination.

"There is an astonishing variety in the different kinds of inflammable air, the cause of which is very imperfectly known. The lightest, and therefore probably the purest kind, seems to consist of phlogiston and water only. But it is probable that *oil*, and that of different kinds, may be held in solution in several of them, and be the reason of their burning with a lambent flame, and also of their being so readily resolved into fixed air when they are decomposed by dephlogisticated air; though why this should be the case, I cannot imagine.

"When inflammable and dephlogisticated air are burned together, the weight of the water produced is never, I believe, found quite equal to that of both kinds of air. May not the *light*, therefore, emitted from the flame, be part of the phlogiston of the inflammable air united to the principle of heat? And as light accompanies the *electric spark*, may not this also be the real *accension* of some phlogistic matter, though it is not easy to find the source of it."

The French chemists, who deny the existence of phlogiston, are of opinion, that inflammable air is a simple uncompounded element; but for a more full discussion of this subject, see the article Phlogiston.

140 Absorption of inflammable air by water.

Inflammable air is absorbed by water in considerable quantity, but by the application of heat may be expelled again in equal quantity. By agitation in water Dr Priestley was formerly of opinion that this kind of air might be rendered as good as common air; but this undoubtedly proceeds from the atmospherical air transmitted by the water, as is the case with phlogisticated air mentioned in the last section. After a quantity of water, which had absorbed as much inflammable air as it could, had been suffered to stand a month, it was expelled by heat, and found to be as strongly inflammable as ever. The water after the process, deposited a kind of filmy matter; which he supposed to be the earth of the metal that had been employed in producing it.

141 Its effects on vegetation and animal life.

Plants in general grow tolerably well in inflammable air, and the willow plant has been observed to absorb great quantities of it. Its inflammability is not diminished by the putrefaction of animal substances, nor does their putrefaction seem to be retarded by it. Animals confined in it are killed almost as soon as in fixed air: but insects, which can live a considerable time in phlogisticated air, live also a considerable time in this kind of air; but at last they become torpid, and appear to be dead, though they will still recover if removed into the open air. Mr Cavallo relates, that the Abbe Fontana, having filled a large bladder with inflammable air, began to breathe it in his presence; after having made a very violent expiration, in which case the effects are most powerful. The first inspiration produced a great oppression in his lungs, the second made him look very pale, the third was scarce accomplished when he fell on his knees through weakness. Birds and small quadrupeds, inclosed in small vessels of this air, died after very few inspirations.

142 Has little refractive power.

Lastly, inflammable air appears to have a smaller share of refractive power than common air; for Mr Warltire informs us, that having placed an hollow triangular prism, of which the angle was 72 degrees, so as to half cover a large object-glass in one of Mr Dollond's perspectives, and so turned round as to make the frame of a window, at the distance of 1280 feet, seen partly through the prism and partly through common air, appear undivided. The inflammable air was then blown out of the prism, but no part of the apparatus was moved; when the frame of the window seen through the object glass and the prism as before, seemed to separate about four inches.

144 Schemes to employ it for various purposes.

The inflammability of this species of air has given occasion to various projects concerning it; such as that of employing it to give light and heat: and lamps have been described, which may be lighted by the electric spark in the night time. By its means also very pretty artificial fires are made, with glass tubes bent in various directions, and pierced with a great number of small apertures. The inflammable gas is introduced into these tubes, from a bladder filled with that fluid, and fitted with a copper cock. When the bladder is pressed, the inflammable air, being made to pass into the tube, issues out of all the small apertures, and is set on fire by a lighted taper. None of these contrivances, however, have ever been applied to any use; and the scheme of Mr Volta, who proposed to substitute its explosive force instead of gun-powder, is found insufficient, on account of the weakness of the explosion, except when the two airs are fired in very great quantity, which would be incompatible with the small bulk necessary for warlike engines.

Sect. VII. *Sulphurated Inflammable Air.*

144 First procured from manganese.

This was discovered by Dr Priestley at the time when he was engaged in the experiment of which some account has been given in the last section, of transmitting the steam of water and other fluids through red-hot tubes containing some solid material. Having, among others, treated manganese in this manner, by stopping one end of the heated tube with a cork before the steam was applied, he received forty ounce-measures of air, of which one sixth was fixed air, and the rest of the standard of 1.7, lambently inflammable. Having then opened the other end of the tube in order to admit the steam, air was procured more copiously than before. Of 50 ounces of this air, one-seventh was fixed, and the rest, of the standard of 1.8, explosively inflammable. The last portions were very turbid; and the smell, especially that of the last portion, was very sulphureous, tinging the water of a very dark colour, by depositing in it a quantity of blackish water. However, the air itself became presently transparent, and had no other appearance than that of any other kind of air. On looking at the jar in about ten minutes after, it was quite black and opaque; so that nothing could be seen in the inside of it. Filling afterwards another jar with the same kind of air, in order to observe the progress of this uncommon phenomenon, he found, that when the water was well subsided, black specks began to appear in different places, and, extending themselves in all directions, at length joined each other, till the whole jar was become perfectly black, and the glass opaque. When this was done, he transferred the air into another jar; and it soon produced a similar effect upon this, though it never became so

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so black as the jar in which it had been first received. It also frequently happened, that only the lower part of the jar would become black, as if the matter with which it was loaded had kept subsiding, though invisibly, in the mass of air, and occupied only the lower regions, leaving the upper part entirely free from it. On exposing to the open air the vessels thus turned black, the colour presently disappeared, and a yellow or brown incrustation was left upon it. The same change took place when the vessels were inverted in water, in order to observe the alteration of the air within them; but on examining this air, no sensible change was perceived. In some cases, indeed, he thought the air was injured, but it was much less so than he had expected. After depositing the black matter, the air still retained its sulphureous smell, and he did not imagine that would ever leave it entirely.

145 Procured from ivory melted in vitriolic acid air.

On trying other specimens of manganese, no air of this kind was obtained; but some time after, having occasion to make a large quantity of inflammable air, he used, instead of fresh iron, some that had been already melted in vitriolic acid air. Dissolving this with a considerable quantity of fresh metal in diluted vitriolic acid, he found that the water in which the air was received became very black, and deposited more sediment than had appeared in the experiment with the manganese. The jars were as black as ink, but became yellow on exposure to the air as before; so that there could be no doubt of its being the same thing he had got before. On burning a quantity of it, this kind of air appeared to contain some vitriolic acid, the balloon being filled with a very dense white fume, which rendered the water sensibly acid to the taste. On decomposing it with dephlogisticated air, however, he found the diminution exactly the same as when common inflammable and dephlogisticated air were used; so that it appeared to contain neither more nor less phlogiston than the other; only there was a small quantity of fixed air produced, which is never the case with common inflammable air from vitriolic acid and iron.

When the sulphurated inflammable air is received over mercury, very little black matter is produced on the jars; and it is remarkable, that though the black matter collected on them, when the air is taken through water, soon grows yellow upon exposing it to the air, it is not the case with that which remains in the water; it adheres to the evaporating vessel in form of a black incrustation, which does not burn blue until it has been digested in the nitrous acid, which deprives it of its superfluous phlogiston, and leaves it both of the colour and smell of sulphur.

Sect. VIII. *Of Alkaline Air.*

This was procured by Dr Priestley, in the beginning of his experiments, from common spirit of sal-ammoniac with quicklime, or the materials from which it is made. He did not at that time prosecute the discovery farther than by impregnating water with it; by which means he could make a much stronger alkaline spirit than any to be met with in the shops. His method of procuring it was by mixing one part of pounded sal-ammoniac with three parts of slacked lime; and for common experiments the same quantity of materials would last a considerable time.

Alkaline Air.

246 Properties of alkaline air.

This kind of air, when pure, is instantly fatal to animal life, and extinguishes flame; though, when mixed with common atmospherical air, it is slightly inflammable, and also medicinal in faintings and other cases of debility. A candle dipped into a jar of this air is extinguished; but just before the flame goes out, it is enlarged by the addition of another flame of a pale yellow colour, and sometimes a weak flame spreads for a considerable way, or even through the whole body of the alkaline air. The electric spark taken in it appears of a red colour. Every spark taken in it augments its bulk, and by degrees turns the whole into inflammable air. It is readily absorbed by water, as has been already observed, and dissolves ice almost as fast as an hot fire. On confining some water impregnated with alkaline air in a glass tube, and thus exposing it to a strong heat in a sand-furnace for some days, he observed that a white sediment or incrustation was formed on the surface. The Dr remarked, that bits of linen, charcoal, and sponge, admitted into a quantity of alkaline air, diminished it, and acquired a very pungent smell; especially the sponge, a bit of which, about the size of an hazle-nut, absorbed an ounce-measure. It is remarkable that copper, which is so easily corroded by the common volatile alkalis, is not affected by alkaline air. The specific gravity of this kind of air is, by Mr Kirwan, determined to be to that of common air as 600 to 1000; though, as he justly observes, this must differ very considerably according to the quantity of moisture it contains.

147 Proofs of its containing phlogiston.

In prosecuting his experiments on alkaline air, Dr Priestley conluded that it contains phlogiston, both from its being convertible into inflammable air by electric explosions, and likewise from its reviving the calces of metals. In attempting to ascertain the quantity of lead revived in alkaline air he met with two difficulties; the first, on account of some part of the calx being blackened and imperfectly revived; the second, that the lead completely revived was dissolved by the mercury employed to confine the air. To prevent this last inconvenience, he put the powdered massicot (the substance he chose to employ on this occasion) into small earthen cups, contriving to place them with their mouths upwards, in such a manner, that when the lead was revived by means of a burning lens, it would remain in the cup, and not mix with the mercury which supported it. The proportions of metal then revived, were six grains of lead in three ounce-measures, $16\frac{1}{2}$ in three measures and an half, 13 in two and an half, and 12 in three and three-fourths; but the experiment on which he laid the greatest stress, was that in which $26\frac{1}{2}$ grains of lead were revived in $7\frac{1}{2}$ ounce-measures of alkaline air. In this proportion, 100 ounce-measures of alkaline air, would revive 352 grains of lead; but an equal quantity of inflammable air from iron would have revived 480 grains of metal. This deficiency appeared somewhat surprising to the Doctor, considering that alkaline air resolved into more than twice its bulk of the inflammable kind; though it is possible, that inflammable air from iron may contain more phlogiston than that into which alkaline air is resolvable.

On heating red precipitate in alkaline air, the mercury was revived as in other cases, and a considerable quantity of water was produced, though none appears on

Alkaline Air. on reviving it with common inflammable air. "It has even (says he) run down in drops in the inside of a vessel which contained five ounce-measures of the air; and a considerable quantity of dephlogisticated air was found in the residuum." On throwing the focus of the lens on red precipitate, inclosed in this kind of air, till three measures of it were reduced to two, water was produced as usual, and the standard of the residuum was 1.7. In another experiment, a violent explosion took place before he could observe whether any water was produced or not.

148 Conversion of alkaline into inflammable air. In examining the phenomena which attend the conversion of alkaline air into the inflammable kind, the Doctor was induced to believe that it was occasioned by heat alone, without the concurrence of light. The effects of the former were first perceived on heating some ochre of iron in alkaline air; when, though the matter turned black, as in an incipient reduction of the metal, he found a considerable increase of quantity instead of decrease in the air, as he had expected; and, on examining the quality of it, he found that it contained no fixed air, but was entirely inflammable. With scales of iron a similar enlargement was perceived; but in this way he could never increase the quantity to more than double that which had been originally employed, and even after this the whole smelled strongly of volatile alkali; and the iron had undergone no change.

The Doctor now, concluding from these experiments that the change of alkaline into inflammable air was produced by this cause alone, proceeded to repeat the experiment, by heating in the alkaline air bits of dry crucibles, or of earthen retorts, which had been just before exposed to very great heats, so that they could not be supposed to give out any air themselves, and therefore could only serve to communicate a strong heat to the alkaline air; and in these experiments the result was the same as when ochre and iron were made use of. The bits of white earthen ware were always turned black; but finding the same effect of augmenting the air and giving it an inflammable quality, though he used the bit of crucible over and over again, he was thoroughly convinced that the change was effected by heat alone.

In all these experiments, however, with a burning-glass, as a strong light was also concerned, he heated a quantity of alkaline air in a green glass retort, receiving in a glass tube, filled with water, all the air that could be expelled from it by heat. At first it was all absorbed by the water, being merely alkaline air expelled by the rarefaction; but when the bulb of the retort became red-hot, he found that the bubbles driven out were not wholly absorbed, and at last none of them were so These were altogether inflammable; so that no doubt remained of the change being produced by heat alone, without any intervention of light.

It was farther observed, that whenever the alkaline air was changed into inflammable by means of bits of retorts or crucibles containing clay, they always became black during the process. He inclined therefore to suppose, that something might be deposited from the air which might attach itself to the clay. "Indeed, (says he) if this was not the case, I do not see why the clay should become black; though, perhaps, part of the same phlogiston which forms the inflammable air may be attracted by the red-hot clay, without there being any proper decomposition of the air. That this is the case seems probable from an experiment in which I used porcelain instead of common earthen ware; which did not become black in the process, though inflammable air was produced."

149 Volatile alkali produced from nitrous air and iron. In some of Dr Priestley's experiments, he had observed that iron, which had long rusted in nitrous air, gave out a strong smell of volatile alkali. This extraordinary phenomenon, however, was only perceived where the nitrous air and iron had been in contact for a very long time; but he found that it was much sooner produced by making use of a weak solution of copper; by putting iron into which he obtained that species of nitrous air called *dephlogisticated*. A phial containing some of this iron, which had been used only once for the purpose just mentioned, having been kept close corked for about two months, was accidentally broken; when some pieces of the iron were found covered with a green crust, and these had a strong smell of volatile alkali. On making some more experiments on this subject, he found that two months standing was requisite to produce the alkaline smell desired.

Sect. IX. *Of Nitrous Air.*

150 How produced. This kind of air is plentifully obtained in all cases where the nitrous acid is combined with phlogiston: Thus, when it is mixed with metals, or animal or vegetable substances, nitrous air is produced in great quantities; but very sparingly when treated with metallic calces, earths, or other matters which are said to contain little or no phlogiston. All the metals, excepting gold, platina, and regulus of antimony, which are not soluble in the pure nitrous acid, yield nitrous air on being treated with it; and even from these, when dissolved in aqua regia, some quantity of this air may be obtained. Every metal, however, does not yield it in equal quantity, with equal facility, or equally good. Silver, copper, iron, brass, bismuth or nickel, when put into nitrous acid, yield this air in considerable quantity: Mercury yields it but slowly without the application of heat, though no great degree of it is necessary. Copper and iron, especially the latter, require the acid to be cautiously applied on account of the violent emission of fumes. Gold, platina, and regulus of antimony, when put in aqua regia, yield nitrous air pretty readily; but lead yields it in smaller proportion than any other metal, and zinc does the same among the semimetals, the elastic fluid produced from it being mostly phlogisticated air.

In the production of this kind of air, great differences are perceived by a diversity in the strength of the acid. Thus, if we dissolve copper in strong nitrous acid, no nitrous air is produced, though the same materials will yield air in great quantity by the mere affusion of water to dilute the acid. This is very properly explained by Doctor Priestley, from the property that the nitrous acid has of attracting phlogiston, which is evident from what happens in the solution of mercury. When strong spirit of nitre is poured upon this metal, the solution soon begins, and is very rapid, yet not a single bubble of elastic fluid is produced; but in a short time the acid next to the mercury is changed into an orange colour, which is an indication of its having acquired phlogiston, probably from the nitrous air

151 Why strong nitrous acid yields its nitrous air.

air which is decomposed the moment it is formed, and before its particles are divided into visible bubbles. The bubbles of air indeed break through the coloured acid, but they disappear the moment they come in contact with the pale-coloured acid. As soon as the whole quantity of acid has assumed the orange colour, nitrous air escapes from it in considerable quantity; but the mixture of water deprives the acid of its power of decomposing nitrous air. The strong and pale-coloured nitrous acid ought to be diluted with at least two or three parts of water to one of the acid, for the easy production of nitrous air from copper and mercury.

In common experiments no other degree of heat is necessary than that produced by the effervescence itself, except mercury be used, which requires the application of some degree of heat; but when the metal exposes a very great surface to the acid, as is the case when the filings of the metal are used, the effervescence and production of nitrous air are often much quicker than can be conveniently managed. The most proper method of producing nitrous air, however, is explained in the last section of this treatise.

152
Properties of nitrous air.

Nitrous air by itself is equally transparent and invisible with common air, excepting at its first production, when it is somewhat coloured, owing to a little superfluous nitrous acid, or to some earthy particles which are carried up with it. Its smell resembles that of nitrous acid, or indeed is the very same; because, in passing through the common air to our nostrils, it is decomposed, and converted into nitrous acid. The same is to be said of its taste; though Mr Fontana, who tasted it without any contact of external air, affirms that it has no taste whatever. The method in which he ascertained this fact was as follows. Having first introduced the nitrous air into a bottle of elastic gum in water, as is done with glass bottles, he brought his mouth, shut, while the neck of the elastic gum bottle was under water, near the neck of it; and then, by pressing the bottle, introduced the nitrous air into his mouth. The experiment, however, is by no means void of danger; for if the person happens to draw any quantity of this air into the lungs, he may be nearly suffocated, as nitrous air is exceedingly noxious. In performing of it, he recommends to exhaust the mouth entirely of common air, though he does not inform us how this can be done; nor indeed is it easy to conceive the possibility of doing so.

Though nitrous air extinguishes flame, it may by certain processes be brought into such a state that a candle will burn in it with an enlarged flame; and it becomes what Dr Priestley calls *dephlogisticated nitrous air*, which is treated of in the next section. It is remarkable, however, that when a candle is extinguished, as it never fails to be in common nitrous air, the flame seems to be a little enlarged about its edges by the addition of another bluish flame before the former goes out.

153
Extremely fatal to animal and vegetable life.

Nitrous air seems to be the most fatal to animal life of any. Even insects, which can bear phlogisticated and inflammable air, generally die the moment they are put into it. Frogs, snails, and other animals which do not respire very frequently, die in a few minutes, and generally do not recover even when taken out of this noxious fluid before they are dead. Plants perish very soon in nitrous air, and even in common air saturated with nitrous air; but Dr Priestley informs us, that "though in general plants die almost immediately in water impregnated with nitrous air, yet in one case of this kind, when the superfluous nitrous air was let out under water, so that no part of it was decomposed in contact with the water, the plant grew in it remarkably well."

Water, by agitation in nitrous air, may be made to imbibe one-tenth part of its bulk; and afterwards the nitrous air may be expelled again by boiling, though not in the same quantity as it was absorbed; but for this purpose the water should be previously deprived of its air. Dr Priestley informs us, that having carefully pumped all the air out of a quantity of rain-water, letting it stand 24 hours in a good vacuum, and then impregnating it with nitrous air, he instantly expelled it again by boiling, when he obtained only about one fourth part of it, though sufficiently pure, and without any mixture of fixed air. Water may also be deprived of the nitrous air it contains, though it does not freeze quite so readily when impregnated with this air as in its natural state.

Nitrous air is absorbed by strong oil of vitriol nearly in the same quantity as by water; the acid acquiring a purple colour, by reason of the phlogiston contained in the nitrous air. The strong nitrous acid absorbs it in great quantity; and becomes smoking, orange coloured, and afterwards green, on account of the phlogiston contained in it. Marine acid imbibes but a small quantity, and very slowly, acquiring at the same time a light-blue colour. Both nitrous air and common air phlogisticated by it are meliorated by agitation in nitrous acid.

Nitrous air is absorbed in considerable quantity by radical vinegar, and the concentrated vegetable acid.—Solution of green vitriol imbibes it in much greater quantity than water, and acquires a black colour; which, however, soon goes off by exposure to the common air. Its taste also becomes acid.—Very little is absorbed by caustic alkalis. Oil-olive slowly absorbs a considerable quantity, but oil of turpentine absorbs much more. By a little agitation, it will imbibe more than ten times its quantity of nitrous air; acquiring at the same time a yellowish or orange colour, and becoming a little glutinous. The part which is not absorbed appears to be converted into phlogisticated air.—Ether and spirit of wine absorb it very quickly, but no nitrous air is obtained by the application of heat after they have absorbed it. It is greatly diminished by oil of turpentine, liver of sulphur, and pyrophorus; all of which leave it in a phlogisticated state. It is also diminished and phlogisticated by being kept in a bladder, alternately exposed to moisture and dryness. Nitrous acid air has the same effect.

One of the most remarkable properties of nitrous air, is its diminution with dephlogisticated air; by which means it becomes a test of the quantity of that kind of air contained in the atmosphere. With pure dephlogisticated air, the diminution is almost to nothing, at the same time that some quantity of nitrous acid is reproduced by the decomposition of the nitrous air; but as our atmosphere is always mixed with a considerable quantity of phlogisticated air, on which nitrous 154
Diminishes dephlogisticated air.

Nitrous Air.

nitrous air has no effect, the diminution in this case is never so considerable. Upon this principle the EUDIOMETER is constructed.

155 Its antiseptic power.

Another very remarkable property of nitrous air is its strong antiseptic power; insomuch that animal matters may, by its means, be preserved for many months without corruption. This property, it was thought, might have been extremely useful on many occasions; but Dr Priestley, after a number of experiments on the subject concludes in the following manner. "Nitrous air will indeed preserve meat from putrefaction; but after long keeping, it becomes very offensive both to the nostrils and palate, though the smell is not altogether that of putrefaction; and indeed the substance continuing quite firm, it could not be properly putrid. —Having formerly experienced the remarkable antiseptic power of nitrous air, I proposed an attempt to preserve anatomical preparations, &c. by means of it; but Mr Key, who made the trial, found, that, after some months, various animal substances were shrivelled, and did not preserve their forms in this kind of air."

156 Specific gravity of nitrous air.

The specific gravity of nitrous air, as well as of other kinds, has been ascertained by Mr Kirwan. As it corrodes metals, he endeavoured to find its weight by comparing the loss sustained by the materials which produce it. Thus he found, that 14 grains of the materials produced 38.74 inches of nitrous air; and, consequently, by proper calculation, that the specific gravity of nitrous air is to that of atmospheric air as 1195 to 1000.—"If this air (says he) had been obtained over water, or in strong heat, its weight would probable have been very different; as it is liable to be mixed with phlogisticated air, nitrous vapour, and a variable quantity of water. Nitrous vapour would render it heavier, and phlogisticated air or water probably lighter."

137 Component parts of nitrous air.

With regard to the constituent principles, or elements of nitrous air, all those who look upon phlogiston to be a distinct substance, have believed that the former is a compound of nitrous acid and phlogiston. By the opposite party, it is supposed to be a substance entirely simple, and one of the constituent parts of the nitrous acid. This opinion seems in part now to be entertained by Dr Priestley himself, notwithstanding his former sentiments on the subject. "I had no doubt on the subject (says he) until I read the work of Mr Metherie; who asserts, that nitrous air contains no proper nitrous acid, but only one of the elements of it; the other being dephlogisticated air, which had before been considered by Mr Lavoisier as the principle of all acidity.—Among other observations in support of his assertion, Mr Metherie has the following. 1. Nitrous air burnt together with inflammable air, produces no nitrous acid. 2. Though nitrous air be obtained from a solution of mercury in the nitrous acid, almost all the acid is found in the solution. 3. Nitrous air, absorbed by marine acid, does not make aqua regia. 4. He is of opinion, that a small portion of the nitrous acid being decomposed, furnishes a pure air, so altered, that, uniting with inflammable air, it changes it into nitrous air.

"In reviewing the experiments I had formerly made on this kind of air, I could not recollect any of them in which the pure nitrous acid was produced, excepting that with dephlogisticated air, besides the experiment in which it was decomposed by the electric spark; which furnishes a strong objection to this hypothesis." To ascertain the matter more fully, the following experiments were made.

"When nitrous air is decomposed by iron, or by a mixture of iron and sulphur, the water, over which the process is conducted, acquires no acidity; but I had supposed that all the acid was absorbed by the iron. Having by me a quantity of this iron which had been reduced to perfect rust in nitrous air, and which, I knew, must have imbibed more than its weight of the air, I thought that the acid might be obtained from it by distillation; but a quantity of this rust of iron, distilled in an earthen retort, yielded neither nitrous air nor nitrous acid, at least in any quantity that could favour the common hypothesis.

"I then endeavoured to decompose nitrous air by heating iron in it with a burning lens; and in this process I succeeded far beyond my expectation: for the air was presently diminished in quantity, while the iron became of a darker colour, was sometimes melted into balls, and gathered considerable weight, though it had no appearance of containing any nitrous acid.—In the first experiment, the original quantity of nitrous air was diminished to about one-third; and after this, it was increased." The increase was found to arise from a production of inflammable and dephlogisticated nitrous air.

The Doctor proceeded to try various other experiments on the decomposition of nitrous air, particularly that of burning Homberg's pyrophorus; but without any success, or obtaining the smallest particle of nitrous acid. His conclusions from the whole are the following.

"Water seems to be a necessary ingredient in nitrous as well as inflammable air; at least without a quantity of water, nitrous air cannot be formed. For example, copper will be dissolved in strong nitrous acid without producing any nitrous air, just as iron may be dissolved in concentrated vitriolic acid without producing inflammable air. 158 Nitrous air composed of phlogisticated nitrous acid and water.

"That nothing is necessary to the formation of nitrous air besides phlogisticated nitrous acid and water, is evident from the production of it by the impregnation of pure water with phlogisticated nitrous vapour formed by the rapid solution of bismuth; an experiment which I mentioned before. However, to make it in a more unexceptionable manner, I interposed a glass vessel between that in which the solution was made and that in which the water to be impregnated with the phlogisticated vapour was contained, that whatever was distilled over by the heat of the process might be prevented from reaching the water. In these circumstances, however, when nothing but the dry phlogisticated vapour could enter the water, it began to sparkle and yield nitrous air very copiously as soon as it had received a bluer tinge from the impregnation.—Nitrous air is also produced by pouring a highly coloured or phlogisticated nitrous acid into pure water, in which no metal or earthy matter is any way concerned.

"I have formerly observed, how readily nitrous air is diminished by taking the electric spark in it. This experiment I have frequently repeated, in order more particularly 159 Effects of the electric spark on nitrous air.

Nitrous Air.

particularly to ascertain the quantity and quality of the residuum. In one experiment half an ounce of nitrous air was reduced, in less than half an hour, to one quarter of its bulk. One-fourth of the residuum was still nitrous, and the rest phlogisticated. Taking the electric spark in a quantity of nitrous air till it was diminished to one-third, the whole was completely phlogisticated, not affecting common air at all, and extinguishing a candle. A white matter was formed with the mercury over which the spark was taken, which made the water admitted to it extremely turbid. In another process, the electric spark was taken in a quantity of nitrous air till it could no more be diminished, when it was reduced in bulk in the proportion of $10\frac{3}{4}$ to 24. Letting it stand all night upon the mercury, it was increased in the proportion of $11\frac{1}{4}$ to 24; seemingly by the acid uniting to the mercury and generating more nitrous air, since it had that smell. No water appeared after the process; and the water admitted to it acquired no acid taste, but an astringent one like that of water impregnated with nitrous air. There was a white powder formed, as in the former experiments.— To try if it were possible to make water imbibe the acid from the nitrous air, the electric spark was taken in it, with a small quantity of water over the mercury. But even this water did not acquire any acid taste, but only an astringent one."

The Doctor concludes his experiments on this subject with a conjecture, that the phlogiston, and neither the heat nor light of the electric, contributes to the decomposition of nitrous air. As his final sentiments on the matter, however, are merely conjecture, without any certain experiments to confirm them, we shall here refer the reader to his Section on Theory, at the end of his sixth volume of experiments, &c.

Sect. X. *Dephlogisticated Nitrous Air.*

160 How procured.

This species differs from common nitrous air in being able to support flame, though it still continues fatal to animal life. Common nitrous air may be converted into the dephlogisticated kind by particular processes; though, when zinc is dissolved in the nitrous acid, if the air be taken at different times, that which comes about the middle, or rather the latter end of the process, will be of this kind; in which it not only supports the burning of a candle, but the flame is enlarged (sometimes to four or five times its original bulk) by the addition of a weaker and bluish flame round the former; and this burning is sometimes accompanied with a crackling noise, as if the candle was burning in dephlogisticated air. It may also be obtained in some part of the process of procuring nitrous air from iron, though with this metal the success is uncertain; but tin yields a considerable quantity of it. By exposing iron to nitrous air, it may be so far dephlogisticated as to admit a candle to burn in it. Dr Priestley filled an eight-ounce phial with nails, and then with mercury; and displacing the mercury with nitrous air, left the phial inverted in a quantity of the same fluid. Two months after, the nitrous air was found to be changed in such a manner as to admit a candle to burn in it with its natural flame; and by continuing still longer in contact with the iron, a candle would burn in it with an enlarged flame. These changes, however, are very irregular, so that they seldom produce the like effects with the regularity one might expect. Dr Priestley once found, that by the contact of iron in quicksilver, it was so changed as to be fired with an explosion like a weak inflammable air; whilst another quantity of nitrous air, which had been treated in like manner for about the same length of time, only admitted a candle to burn in it with an enlarged flame.

Dephlogisticated Nitrous Air.

161 Component parts of dephlogisticated nitrous air.

In that section of his last volume in which the Doctor treats of this kind of air, he observes, that water is absolutely necessary to its composition, or rather to the decomposition of the common nitrous air by iron. He had decomposed it before, either by previously filling the vessels that were to contain the nitrous air with water or with mercury; though it had always required a much longer time when the latter was made use of. The reason of its being formed at all in this last way, was a small quantity of moisture adhering to the inside of the vessel containing the mercury.

162 Effects of water on nitrous air.

To try the influence of water in this case, he now procured a number of very clean small needles; and having made a phial, and likewise a proper quantity of mercury, quite clean and dry, he put the needles into the phial, and, filling it up with mercury, introduced the nitrous air: but it continued in this way for six or eight months without the smallest alteration. Introducing a few drops of water, a diminution of about one-third of the air took place, and the remainder appeared to be phlogisticated. On the 26th of May 1782, he examined a quantity of nitrous air, which had been confined with iron-shavings from the 27th of August preceding, when he found one-half of it absorbed; the remainder supported the flame of a candle better than common air, though a mouse died in it; and yet this air had continued several months in the same state with regard to quantity, nor was it at all probable that its quality would have been altered by any length of time.

163 Best method of procuring it.

Though this kind of air is produced by the contact of iron and nitrous air, the Doctor has never been able to ascertain the quantity of nitrous air which a given quantity of iron can decompose; and though iron soon becomes so much affected by this process that it crumbles into powder, it still seems equally capable of decomposing a fresh quantity. Having made a comparative experiment, by putting together one quantity of nitrous air with fresh iron and another with rust, he found that in both the air was diminished to about one-third, and a candle burned in both equally well; but neither of them had the properties of fresh nitrous air in any degree.

As the process for obtaining dephlogisticated nitrous air by means of iron is very tedious, the Doctor endeavoured to find another which might be attended with less inconvenience. This he accomplished by dissolving turnings of iron in a dilute solution of copper in nitrous acid (the same that remains after the production of nitrous air), mixing it again with an equal quantity of water. Without this precaution, he tells us, that though the iron will at first be acted upon very slowly, yet the mixture will at length grow so hot as actually to boil, and the process will be exceedingly troublesome; however it will be necessary previous to any attempt to dissolve the iron, to heat the solution of copper, in order to expel all the nitrous air and superfluous

Dephlogisticated Nitrous Air. fluous nitrous acid. Without this precaution a quantity of common nitrous air will be produced.

Dephlogisticated nitrous air is absorbed by water almost as readily as fixed air, and in considerable quantity; the liquid taking up about one-half its bulk of air. After being thus saturated, the whole quantity of dephlogisticated nitrous air may be expelled pure by heat, and is easily received in vessels containing mercury. It was likewise observed, that as this kind of air much resembles fixed air in its properties of being imbibed by water, and expelled again by heat, it resembles it also in this farther property, that all the air which has been actually incorporated with the water will not be imbibed by water again. But the proportion of this part is three or four times greater than the corresponding part of fixed air; it is also considerably more phlogisticated. Water impregnated with it very soon parts with it again on being exposed to the atmosphere.—It discovers not the smallest trace of containing either acid or alkali. Its specific gravity is less than that of common air. On heating red precipitate in this kind of air, pure phlogisticated air was produced without affecting, or being affected by, the nitrous air. Repeating the experiment with malleable iron, the quantity of it was enlarged, and the whole phlogisticated, without any mixture of fixed air. By

164 Made to approach to the nature of atmospherical air. heating bits of clean crucibles or retorts in this kind of air, it seemed to approach in quality to common atmospherical air; and the effects were always found to be the more considerable the longer the process was continued. On attempting, however, to determine whether this change in the constitution of dephlogisticated nitrous air was occasioned by means of heat or light, he heated it in earthen tubes; but found, that though these were glazed both on the outside and inside, and seemed perfectly air-tight both before and after the experiment, the air had escaped. By the electric spark it was rendered wholly immiscible with water, and brought to the standard of 1.45; so that the Doctor had no doubt of its being respirable. Yet this kind of air, though it admits a candle to burn so well in it, will not kindle pyrophorus, though the nitrous air from which it is produced would instantly set it on fire.

Sect. XI. *Of Vitriolic, Nitrous, Marine, and other Acid Airs.*

165 How procured. § 1. *Vitriolic acid Air.*—This is always a combination of vitriolic acid with phlogiston, and consequently may be procured from any mixture of that acid in its highly concentrated state with phlogistic matters. Hence it is obtained from all the metals, gold and platina excepted, on boiling them with strong oil of vitriol. It is also procurable from the same acid rendered black by any phlogistic matter. No greater heat is required to expel this kind of air than that produced by the flame of a candle. It is the heaviest of all aërial fluids, next to fluor acid air, being to common air as 2265 to 1000. Dr Priestley informs us, that a quantity of vitriolic acid thus impregnated with phlogiston, will yield many times more air than an equal quantity of the strongest spirit of salt.—When the vitriolic acid air is produced in great plenty, the top of the phial in which it is generated is commonly filled with white vapours. The air has also the same appearance as it is transmitted through the glass tube; and it is sometimes discoverable in the recipient. When such substances are put to the oil of vitriol as cause a great effervescence with that acid, care should be taken to add them by very small quantities at a time, and likewise to apply the heat by very slow degrees, lest the rapid production of air, and the heat attending it, should break the vessels. It is most equably produced by using strong oil of vitriol and charcoal; but in most cases the production of vitriolic acid air is attended with that of inflammable, and sometimes fixed or phlogisticated air. With ether about one-half of the first produce is inflammable; but the quantity lessens as the process goes on. The Doctor observed, that, when quicksilver was used, the acid was not turned black, as in other experiments of the like nature. He also observed, that iron yielded a little inflammable air together with the acid gas; but that the elastic fluid produced when zinc was used, contained about two parts of inflammable and one of acid air. Copper, silver, and lead, when heated in vitriolic acid, yield the purest vitriolic acid air without any mixture of inflammable air; but the lead yields only a very small quantity, and requires a great degree of heat. It is procured in the greatest abundance from the fumes of burning sulphur, and is then called the *volatile vitriolic*, or *sulphureous acid;* for an account of the properties of which, see Chemistry, (*Index*).

§ 2. *Of Nitrous Acid Air.*—This is the pure nitrous acid by itself, without any addition of phlogiston. It is procured by heating the strong spirit of nitre in a phial, and then receiving the vapour in glass vessels filled with quicksilver. It is, however, extremely difficult, or rather impossible, to preseve it for a length of time by means of any fluid hitherto known. Water absorbs it immediately, and quicksilver is corroded, and produces nitrous air. "But (says Dr Priestley) tho' the acid vapour very soon unites with the quicksilver, yet, the jar in which it was received being narrow, the saline crust which was formed on the surface of the quicksilver, impeded the action of the acid upon it till I had an opportunity of admitting water to the air I had produced, and of satisfying myself, by its absorption, of its being a real acid air, having an affinity with water similar to other acid airs."

166 How obtained.

167 Cannot be preserved by means of fluids.

168 Assumes a red colour by being heated.

The most remarkable property of this vapour is, that its colour may be made more or less intense by the mere circumstance of heat. It may be confined in glass vessels with ground-stoppers, or in tubes hermetically sealed, and thus exposed to the action of heat: in which case it will be found, that the colour of the vapour becomes considerably more intense in proportion as the glass vessel containing it is more or less heated; and that, on the contrary, the intensity of the colour diminishes as it is cooled. "It seems probable (says Dr Priestley), that if this vapour was not confined, but had room to expand itself, it would become colourless with heat. This at least is the case when it is combined with water. The phenomena I refer to are very common in the process for making dephlogisticated air, in which I first observed them. But the same things are observable in the process for producing any other kind of air in which much spirit of nitre is made use of; and likewise constantly in the common process for making spirit of nitre itself. It is, that when the heat is moderate, the vapour within the

Marine Acid Air.

the glass tube or retort is red; but that, as the heat increases, it becomes transparent." The Doctor having observed that red lead, impregnated with nitrous vapour, may be preserved a long time without deliquescing or losing its acid, made use of a composition of this kind for procuring the nitrous vapour with which he filled his tubes. By imbibing this vapour the minium lost its red colour and became white. "I put (says he) a small quantity of this white minium into a glass tube closed at one end; then holding it to the fire, make it emit the red vapour till the whole tube is filled with it; and having the other end of the tube drawn out ready for closing, as soon as the vapour begins to issue out of that end, I apply my blowpipe and seal it. By this means I conclude that the tube is filled with a pure red vapour, without any mixture of nitrous air, and perhaps common air also." For a further account of the properties of nitrous acid air, see CHEMISTRY, (*Index.*)

169 Its effects on red-lead.

§ 3. *Of Marine Acid Air.*—The marine acid, by heat, may be resolved into a permanently elastic and transparent invisible vapour, which, however, is more easily preserved in its aërial state than nitrous acid air, as the former has no effect upon quicksilver. An easy, and cheap method of obtaining this kind of air is by filling a phial, fitted with a glass tube and stopper, with common salt, and then pouring a small quantity of oil of vitriol upon it; which, by the assistance of heat, will disengage the acid principle, or the marine acid air, from the salt. "A phial (says Dr Priestley) prepared in this manner will suffice, for common experiments, many weeks; especially if some more oil of vitriol be occasionally put to it. It only requires a little more heat at the last than at the first. Indeed, at first, the heat of a person's hand will often be sufficient to make it throw out the vapour. In warm weather it will even keep smoking many days without the application of any other heat. On this account it should be placed where there are no metallic utensils which it can corrode; and it may easily be perceived when the phial is throwing out this acid vapour, as it always appears in the open air in form of a light white cloud."

170 How obtained.

171 Its properties.

After the marine acid has yielded all the air that can be expelled from it, it is extremely weak, so that it can but barely corrode iron. The gas itself is considerably heavier than common air, the specific gravity of the two being in the proportion of five to three; a cubic inch weighing 0.654 grains. It is very fatal to animal life, but less so than pure nitrous air; for flies and spiders live longer in marine acid than in nitrous air. In dipping a candle into a jar of this air the flame is extinguished; but the moment before it goes out, and also when it is afterwards first lighted again, it burns with a green or light-blue flame, like that of common salt thrown into a fire. Its diminution by the electric spark is barely perceptible. Ice is dissolved by it as fast as if it touched a red-hot iron. It is partly absorbed by almost every substance containing phlogiston, and the remaining part becomes inflammable. Oil of olives absorbs it very slowly, and oil of turpentine very fast; by which they both become almost black, and the remainder of the air is inflammable. Essential oil of mint absorbs marine air pretty fast, becoming brown, consistent, and so heavy as to sink in water; and its smell is in great measure altered. Ether absorbs it very fast, and has its colour altered by the impregnation, becoming first turbid, then yellow, and at last brown. The air over the ether is strongly inflammable. A small bit of phosphorus smoked and gave light in this acid air; and the elastic fluid was but little diminished in twelve hours. On the admission of water, about four-fifths of the gas were absorbed, and the rest was inflammable. This change was also effected by a great number of other substances: some of which, however, require a considerable time to produce their effect; such as crusts of bread not burned, dry wood, dry flesh, roasted pieces of beef, ivory, and even flints. See CHEMISTRY, (*Index.*)

Fluor Acid Air, &c.

172 Changed into inflammable air.

§ 4. *Of Fluor Acid Air.*—The discovery of fluor acid air was made by Mr Scheele, who obtained it by distilling the spar called fluor with vitriolic acid. Dr Priestley, who made several experiments upon the subject, was of opinion that this new acid was only the vitriolic disguised by its connection with the fluor. He even supposed that he had produced it by pouring vitriolic acid on other phosphoric spars: both these opinions, however, he has now retracted, and believes the fluor acid to be one of a peculiar kind. Its most remarkable property is the great attraction it has for siliceous earth, so that it even corrodes and makes holes in the retorts in which it is distilled. See CHEMISTRY, (*Index*).

173 Different from vitriolic acid air.

§ 5. *Of the Vegetable and other Acid Air.*—By means of heat alone, the concentrated vegetable acid emits a permanently elastic and aërial fluid. This has the properties of the acid of vinegar; but, like it, is weaker than the rest of the mineral acid airs, though it agrees with them in its general characters. Water imbibes it as readily as any of the other acid airs; oil-olive readily absorbs it, and in considerable quantity, losing at the same time its yellowish colour, and becoming quite transparent. Common air is phlogisticated by it, as it is also by the liquid vegetable acid. As the vegetable acid, however, from which this air had been obtained, was distilled by oil of vitriol, the Doctor suspected that what he had examined might derive most of its properties from the oil of vitriol, and rather be vitriolic than vegetable acid air.

174 Phlogisticates common air.

175 Air from solution of gold.

An acid air, somewhat different from any hitherto described, was obtained by Dr Priestley from the vapour arising on distilling to dryness a solution of gold in marine acid impregnated with nitrous acid vapour, which makes the best kind of aqua regia. "The produce (says he) was an acid air of a very peculiar kind, partaking both of the nature of the nitrous and marine acids; but more of the latter than of the former, as it extinguished a candle; but it was both extinguished and lighted again with a most beautiful deep blue flame. A candle dipped into the same jar with this kind of air went out more than 20 times successively, making a very pleasing experiment. The quantity of this acid air is very great; and the residuum I have sometimes found to be dephlogisticated, sometimes phlogisticated, and at other times nitrous air."

SECT. XII. *Of Hepatic Air.*

THIS species of air, first particularly taken notice of by Mr Bergman, who obtained it from an ore of zinc

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zinc called *Pseudogalena nigra Dannemorensis*, and which was found to contain 29 parts of sulphur, one of regulus of arsenic, six of water, six of lead, nine of iron, 45 of zinc, and four of siliceous earth. The hepatic air was produced but in small quantity by pouring oil of vitriol on this mineral; spirit of salt produced it in much larger quantity; but nitrous acid produced only nitrous air. The most proper method of obtaining this air is by pouring marine acid on hepar sulphuris, which extricates it in vast quantity. It is said also to be sometimes produced naturally from putrefying matters. It is the characteristic of all livers of sulphur, whether they be made with alkalis or earths. The smell of the pure gas is intolerable; and the vapour has a disagreeable effect on many metallic substances, particularly silver, lead, copper, &c. destroying their colour, and rendering them quite black. It is suddenly fatal to animal life, renders syrup of violets green, and is inflammable, burning with a very light blue flame. It is decomposed by vitriolic and nitrous air, by dephlogisticated air, and by the contact of atmospherical air, in which case it deposits a small quantity of sulphur; being indeed, as is supposed by Mr Bergman and Mr Kirwan, no other than sulphur kept in an aërial form. Its specific gravity, compared with that of atmospherical air, is as 1106 to 1000. It combines readily with water, and gives the smell to the sulphureous medicinal waters. Its great attraction for some of the metals and their calces makes it the basis of some *Sympathetic Inks*. See also Chemistry, (*Index*.)

176 Produced first from an ore of zinc.

177 Best obtained from hepar sulphuris.

Sect. XIII. *Of Atmospherical Air.*

The two component parts of our atmosphere, viz. dephlogisticated and phlogisticated air, have been so fully treated of under their respective sections, that little remains to be said in this place, excepting to determine the proportion in which they are usually met with in the common air. The only regular set of experiments which have been made on this subject are those of Mr Scheele. He constructed an eudiometer, consisting of a glass receiver, which could contain 34 ounces of water, and a glass cup containing a mixture of one pound of iron-filings, and an equal weight of flowers of sulphur moistened; which cup standing upon a glass supporter, was inserted in the former receiver, which, when this was in it, could contain 33 ounces of water. To the outside of the glass tube or receiver, was affixed a slip of paper, to the height of a third of the tube, containing 11 divisions, each corresponding to one ounce of water. This paper was varnished over with oil varnish, to prevent its being spoiled by water. The whole then was placed in water, which gradually rose as the air was diminished. This mixture would serve four times before the power of diminishing air was lost. He carefully compared the height of the air therein with the barometer and thermometer, both before and after the experiment; in eight hours the experiment was completed. With this instrument he examined the goodness of the common air in Stockholm every day for a whole year, and found the diminution never to exceed $\frac{10}{33}$, nor to fall short of $\frac{8}{33}$; so that upon a medium it may be estimated at $\frac{9}{33}$. During the months of January and February it was $\frac{9}{33}$. The 23d of March it was $\frac{8}{33}$, though the cold increased, and the barometer stood higher than before. The 19 of April it was $\frac{10}{33}$, though the barometer and thermometer did not vary, and so stood till the 21st. In May and June it stood between $\frac{8}{33}$ and $\frac{9}{33}$. The 30th of July it stood at $\frac{10}{33}$. From the 3d to the 15th of September at $\frac{9}{33}$. The 6th of October at $\frac{10}{33}$, during a high storm; but after it stood between $\frac{8}{33}$ and $\frac{9}{33}$, till the 4th of November, when it fell to $\frac{8}{33}$, and continued between $\frac{8}{33}$ and $\frac{9}{33}$ to the 20th, when it rose to $\frac{10}{33}$. The 21st it fell to 8, and stood between $\frac{8}{33}$ and $\frac{9}{33}$ till the 8th of December, when it rose to $\frac{9}{33}$; and from thence to the 31st it stood between $\frac{8}{33}$ and $\frac{9}{33}$.

178 Proportion of the two ingredients of which it is composed.

As it has already been shown that the pure dephlogisticated part of the atmosphere is entirely consumed by phlogistic processes, such as that of fermenting brimstone and iron-filings, this eudiometer must be considered as an exact test of the proportion of dephlogisticated air contained in the atmosphere. The small variation in the quantity shows, that the processes in nature which destroy this air, are nearly balanced by those which produce it; though it must appear surprising, that both these fluids, so extremely different, should be produced at all seasons of the year in a proportion nearly equal; nor is it less surprising that two fluids of unequal specific gravity should remain incorporated together without any tendency to separate, which it is certain they never do, either in the atmosphere itself, or when confined in vessels in any quantity whatever.—As phlogisticated air is somewhat lighter than dephlogisticated, it might be supposed that the former would occupy the higher regions of the atmosphere in such a manner as to render them considerably more unwholsome than the lower parts; but this seems not to be the case: On the contrary, it appears by experiments with the eudiometer, that the upper parts of the air contain a greater proportion of dephlogisticated air than those near the earth. See Eudiometer.

179 Upper regions of the air more salubrious than the lower.

Sect. XIV. *Of the artificial Production of Airs of different Kinds.*

§ 1. *Fixed Air*, or *Aërial Acid*. The artificial methods of producing this are principally three, viz. by fermentation, by heat, and by acids.

(1) *By Fermentation*. When vegetable or animal substances, especially the former, are fermented, they yield a great quantity of fixed air. In breweries, on the surface of the fermenting liquor, there is always a stratum of fixed air reaching as high as the edge of the vats; so that if these vessels are deep, and the fermenting liquor much below their edges, the abovementioned stratum may be some feet in thickness. The same phenomenon is observable in the fermentation of wines in general; and it is owing to the production and elasticity of fixed air, that fermenting liquors, when put into close vessels, often burst them with great violence. The case is the same whatever substance it is that undergoes the vinous fermentation, though the quantity of fixed air produced is not the same in all substances, nor even in the same substance at different times. From 42 cubic inches of beer Dr Hales obtained 639 cubic inches of air in 13 days. From a quantity of sugar undergoing

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undergoing the vinous fermentation, Mr Cavendish obtained so much fixed air, that out of 100 parts of the former 57 appeared to have been volatilized and converted into fixed air.

But though a vast quantity of fixed air escapes during this process of fermentation, a very considerable portion still remains united with the fermented liquor, and to this it owes all its briskness and agreeable pungent acidulous taste; for when the fixed air is totally evaporated, the liquor becomes entirely vapid and flat. Hence also we are furnished with a method of restoring the briskness to these liquors after they have lost it in consequence of being exposed to the atmosphere, viz. by impregnating them again with fixed air, either naturally or artificially produced.

Dr Priestley has made several experiments in order to determine the quantity of fixed air contained in several sorts of wine. His method was to take a glass phial (fitted with a ground stopple and tube), capable of containing $1\frac{1}{2}$ ounce-measure. This he filled with wine, plunged it into a proper vessel of water. The whole was then put over the fire, and the water, into which the phial was plunged, suffered to boil. The end of the tube being placed under the mouth of an inverted receiver filled with quicksilver, the heat expelled the fixed air from the wine, which entering into the receiver, ascended in bubbles through the quicksilver to the top, pushing out part of the metal and taking its place. The result of his experiments was as follows:

$1\frac{1}{2}$ oz. meas. of	Madeira	contained of pure fixed air	$\frac{1}{100}$	of an ounce meas.
	Port of six years old		$\frac{1}{48}$	
	Hock of five years		$\frac{1}{24}$	
	Barrelled claret		$\frac{1}{12}$	
	Tokay of 16 years		$\frac{1}{20}$	
	Champagne of two years		2 oz. meas.	
	Bottled cyder of 12 years		$3\frac{1}{4}$ ditto.	

During the acetous fermentation also, liquors emit a vapour, great part of which is fixed air, though the nature of its other component parts has not yet been thoroughly ascertained.

Fixed air is likewise produced, though in no great quantity, by putrefaction. In this case, however, a great part of the elastic fluid consists of inflammable and phlogisticated air, and the fixed air itself seems to be intimately connected with a putrid offensive effluvium. It seemed to Dr Priestley to "depend in some measure upon the time and other circumstances in the dissolution of animal or vegetable substances, whether they yield the proper putrid effluvium, or fixed or inflammable air."

The elastic fluid produced by putrefying vegetables, when kept in a moderate degree of heat, is almost all fixed air; while that from animal substances contains several times more inflammable than fixed air. Vegetable substances yield almost all the permanently elastic fluid in a few days, but animal bodies continue to emit it for several weeks. When the elastic fluid yielded by animal substances is absorbed by water, and that water boiled, the fixed air may then be obtained without any mixture of the putrid effluvium. It is also to be observed, that the quantity of elastic fluid producible from animal substances is various according to the nature of the parts of the animal employed. Thus the muscular parts will yield less elastic fluid, and also less mixed with any putrid or offensive effluvium, than a whole animal, or than the liver, &c. The proportion of inflammable and of fixed air is also various, according to the various parts employed.

(2.) *By heat.* In every combustion, except that of sulphur or of metals, a quantity of fixed air is generated. This may be observed by fixing a lighted candle in an inverted receiver over a bason of lime-water, for a precipitation of the lime will presently ensue; and the same precipitation (which is one of the characteristics of fixed air) will always ensue, whether a candle, a burning piece of wood, or, in short, any other combustible substance, except sulphur or metals, be made use of.

During this production or extrication of fixed from atmospherical air, the latter is commonly supposed to be considerably diminished, though M. Lavoisier and Mr Scheele have now rendered that opinion doubtful. If a piece of charcoal be burned by throwing the focus of a lens upon it when contained in a glass-receiver inverted in water, after the apparatus is cooled, the water will have mounted a small way into the receiver. The diminution, however, is limited, and depends on several circumstances. Dr Hales has observed, that, in equal receivers, the air suffers a greater diminution by burning large candles than small ones; and likewise that, when equal candles are made use of the diminution is greater in small than in large receivers. The cause of this phenomenon probably is, that the air contained in the receiver cannot all come into contact with the flame of the candle; whence, as soon as the air which is nearest the flame becomes contaminated, the candle is extinguished. Thus the author of a Concise Treatise on the Various kinds of Permanently Elastic fluids, has diminished the air of an inverted receiver one sixth part, by moving the candle whilst it burned through the different parts of the vessel, so that the flame was brought into contact with a greater quantity of the confined air than if it had remained in one situation till it became extinct. Dr Mayow observed, that by the burning of a candle the air was diminished of one thirtieth only; Dr Hales found it to be diminished of one twenty sixth part; and Dr Priestley found it to be diminished of one fifteenth or sixteenth. Mr Cavendish observed, that air suffered a diminution of one-tenth of the whole quantity, by passing through an iron-tube filled with red-hot powder of charcoal. A candle, or any other combustible body, will cease to burn by itself, and consequently to contaminate a quantity of confined air much sooner than when it is, in some manner, forced to burn by the external application of heat. "The focus of a burning mirror," says Dr Priestley, "thrown for a sufficient time either upon brimstone or wood, after it has ceased to burn of its own accord, and has become charcoal, will have a much greater effect of the same kind, diminishing the air to its utmost extent, and making it thoroughly noxious." The combustion of the phosphorus of urine diminishes air in a great degree. Mr Lavoisier has observed, that by the combustion of phosphorus, air may be diminished of about one-fifth or one-sixth. This accurate philosopher has also observed, that the acid of phosphorus thus formed, acquires the weight lost by the diminished air; finding that about three inches of air were absorbed by every

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one

Of Artificial Airs. one grain of phosphorus, when the experiment was tried with a receiver inverted in water, upon the surface of which a small quantity of oil had been introduced; but when the receiver was inverted in quicksilver, the absorption was constantly between two one-fourth and two three-fourth inches for each grain. Mr Cavallo mentions his having often repeated the experiment of burning phosphorus in a glass tube inverted in water, by applying the closed part of the tube, wherein the phosphorus was contained, to a pretty strong fire, when he always observed that the utmost diminution of the inclosed air effected by this means was full one-fifth.

Dr Hales remarked, that after the extinction of candles in a receiver, the air continued to diminish for several days after. This may be owing to the gradual absorption of part of it by the water; it having been remarked by Dr Priestley, "that this diminution of air by burning is not always immediately apparent, till the air has passed several times through water; and that when the experiment was made with vessels standing in quicksilver instead of water, the diminution was generally inconsiderable till the air had passed through water."

In these experiments of burning combustible bodies in a quantity of air, and measuring the diminution, we should always remark two causes of mistake, viz. the absorption of air by the coaly residuum of the burned matter, which sometimes is very considerable, or by the fluid in which the receiver is inverted, and the production of elastic fluid from the burning substances; thus gunpowder generates a great quantity of elastic fluid when inflamed, &c.

Even the electric spark separates fixed air from common atmospherical air; for when a number of these sparks are taken in a small quantity of common air over lime-water, a diminution will take place, the lime will be precipitated, and if we put a blue vegetable juice instead of the lime-water, it will be turned red by the acidity of the fixed air deposited upon it. Dr Priestley having cemented a wire into one end of a glass tube, the diameter of which was about one-tenth of an inch, and having fixed a brass ball to that extremity of the wire which was out of the tube, filled the lower part of it with the juice of turnsole or archil, so that a quantity of common air was contained in the tube between the extremity of the wire and the surface of the liquor. Then taking the electric sparks between the said wire and liquor for about one minute, the upper part of the liquor began to look red, and in about two minutes it was manifestly so. The air at the same time, was diminished in proportion as the liquor became red; but when the diminution arrived to be one-fifth of the quantity of the air contained, then a longer electrization produced no sensible effect. "To determine," says the doctor, "whether the cause of the change of colour was in the air or in the electric matter, I expanded the air which had been diminished in the tube by means of an air-pump, till it expelled all the liquor, and admitted fresh blue liquor in its place; but after that, electricity produced no sensible effect, either on the air or on the liquor; so that it was evident that the electric matter had decomposed the air, and had made it deposit something that was of an acid nature."

The calcination of metals, as already observed, phlogisticates, and consequently diminishes common air; but does not produce any fixed air, since the lime-water, over which the calcination is made, does not become turbid; and when metallic calxes are exposed to a sufficiently strong heat, they in general yield some fixed air: so that it seems that the fixed air which is formed in the act of the calcination of metals is absorbed by the calx. Some fixed air may be obtained from red lead, by no greater degree of heat than that of the flame of a candle applied to the phial that contains it.

180 Obtained from earths by means of heat.

The calcareous earths, which, when acted on by acids, yield a vast quantity of fixed air, produce a very small quantity of it when exposed to a strong heat by themselves, in a proper vessel, even when exposed to the focus of a lens. Dr Priestley, in his experiments relating to the production of dephlogisticated air from various substances, when moistened with nitrous acid, and afterwards exposed to a sufficient degree of heat, generally found that some fixed air was produced together with the dephlogisticated air; but often obtained fixed air only, without any dephlogisticated air being mixed with it, or fixed and nitrous air together. From half an ounce of rust of iron, moistened with spirit of nitre, and dried, he obtained about a quart of elastic fluid, about one-third of which was fixed and the rest nitrous air. From ashes of pit-coal, treated in the same manner, he obtained nearly the like result. But in those experiments, the Doctor mostly used a gun-barrel, into which he introduced the substances to be tried; so that it is very probable, as he justly observes, that the iron might have contributed to the formation of the fixed air. In fact, when he tried substances of the same sort, first in a gun-barrel and then in glass vessels, he obtained much more fixed air in the former than in the latter case. One of those experiments he made with tobacco-pipe clay, which, after being moistened with spirit of nitre, was when dry exposed to the fire in a gun-barrel, and yielded some elastic fluid, which appeared to be wholly fixed air; but repeating the experiment in a glass-phial with a ground stopple, and taking the produced elastic fluid at eight different times, found that on the beginning some fixed air was produced, but afterwards the produce was dephlogisticated air. He made a similar experiment with flints carefully calcined in close vessels, and obtained a similar result.

181 From different minerals.

Most minerals contain fixed air, which may be extracted to a certain degree by means of heat. Mr Krenger, distilling a greenish fusible spar, which was luminous in the dark, obtained from it some permanently elastic fluid, which, like fixed air, crystallized a solution of fixed alkali. Mr Fontana in his analysis of the malachite, finds that that mineral contains a vast quantity of fixed air, as pure as that which is extracted from chalk by means of vitriolic acid.

From almost every metallic ore and earthy mineral some fixed air may be obtained, as well as from chalk, lime-stone, marble, marine shells, fixed and volatile alkali, and from magnesia alba, by means of a violent fire, or of acids.

In Mr Boyle's, Dr Boerhaave's and Dr Hales's works, and in other books, the quantities of elastic fluid generated in various processes, and by divers substances, are mentioned with distinction, but as those writers are not acquainted with the characterestic properties of fixed air, we do not know whether the elastic fluid mentioned by them was pure fixed air or not.

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From animal substances, mixed with spirit of nitre, and sometimes heated a little, in order to facilitate the production of elastic fluid, Dr Priestley obtained, in general, fixed air; but whereas the fixed air produced by a similar process with vegetable substances is mostly mixed with nitrous air, this is mixed with an elastic fluid, which is seldom nitrous in a very slight degree, but is often phlogisticated air, viz. in such a state as extinguishes a candle, does not diminish common air, nor is itself diminished by nitrous air. Towards the end of the process, the Doctor remarks, "that when by means of a strong heat, the produce of air is very rapid, and the air full of clouds, it is, like air, produced from vegetable substances in the same circumstances, slightly inflammable, burning with a lambent, greenish, or bluish flame."

182 Abundantly produced from calcareous substances.

(3.) *By acids.* Calcareous substances in general produce abundance of fixed air when acted upon by any acid, only the strongest acids will expel from them more fixed air than the weakest; and it happpens to be peculiarly advantageous for those who want to produce a great quantity of fixed air, that the vitriolic acid is both the cheapest and strongest acid, and, upon the whole, the fittest for this purpose. The phenomena attending the production of fixed air from calcareous substances, &c. are themselves very remarkable, and furnish the subject of much speculation in philosophy. —The principal facts are the following. 1. When calcareous earths, alkalis, and magnesia, in their usual state, are mixed with acids, they cause an effervescence; and consequently the production of a permanently elastic fluid, namely, fixed air. 2. These substances retain the fixed air very obstinately; so that a strong fire is necessary to expel it from magnesia, and the strongest is not sufficient to expel it entirely from fixed alkalis, and especially from calcareous earths (A). When these substances are treated with acids, they yield the fixed air, because they have a stronger attraction to those acids than to the fixed air. 3. The calcareous earths which are insoluble in water, when deprived of the fixed air become soluble in it. Thus lime-stone is not soluble in water, but lime (viz. lime-stone deprived of its fixed air (is soluble in water. And if those substances, deprived of their fixed air, are put in a situation proper to recover their lost fixed air, they lose the property of being soluble in water. Thus, when lime-water is exposed to fixed air, the lime absorbs the fixed air; and, losing at the same time its property of being soluble in water, is precipitated from it in the state it was before calcination, viz. of a calcareous earth insoluble in water, and capable of effervescing with acids. 4. Alkalis, both fixed and volatile, when deprived of their fixed air, become more caustic, and more powerful solvents, incapable of crystallization, and of effervescing with acids. But if to those alkalis, and also earths rendered more caustic, their fixed air be restored, they acquire at once all the properties they had before they were deprived of the fixed air, viz. they become more mild, effervesce with acids, recover their weight, &c.

Those properties of calcareous earths and alkalis were ascertained by the learned Dr Black, who performed a variety of decisive and well-contrived experiments, upon which he formed a just theory, viz. that the causticity, sharpness, solubility, &c. of those substances, was owing to the fixed air being expelled from them; and that when they were combined with a proper quantity of fixed air, they were mild, &c. The Doctor gives the epithet of *mild* to those substances when they are combined with air, and of *caustic* when deprived of it; as caustic calcareous earth, caustic fixed alkali, &c. Among the other experiments, he connected two phials by means of a bent tube; in one of which he put some caustic spirit of sal ammoniac, and in the other some mild alkali, or mild calcareous earth; then pouring, through a hole made in the side of the latter phial, some acid upon the mild alkali, so as to produce some fixed air, which, passing through the tube into the other phial, combined with the spirit of sal ammoniac, and rendered it mild.

Easy methods of obtaining Fixable Air for occasional Experiments, &c.

(1.) *By Fermentation.* Mix together equal parts of brown sugar and good yest of beer, to which add about twice the bulk of water. This mixture being put into a phial, to which a bent tube with a cork may be adapted, will yield a considerable quantity of fixed air, which may be received into a phial filled with quicksilver or water, as in the following process.

(2.) *By Acids.* Let a glass tube, open at both ends, be bent, by means of a blow-pipe and the flame of a candle, nearly into the shape of an S, as it is represented by AB, and fix a cork D to one of its extremities, so as to fit the neck of a common phial, that may hold about four or five ounce measures. The hole through the cork may be made with an iron wire redhot, and the tube may be fastened in it with a bit of soft wax, so as not to let any air go through. Fill a similar phial, or any glass receiver K, with water, and invert it after the manner shown above, in a bason HI, about half filled with water. Now put some chalk or marble, grossly powdered, into the bottle E, so as to fill about a fourth or fifth part of it, and upon it pour some water, just enough to cover the chalk; then add some oil of vitriol to it, which needs not be more than about the fourth or fifth part of the water. Immediately after, apply the cork D, with the tube AB, to the bottle, and putting it in the situation FG, let the extremity B of the tube pass through the water of the bason into the neck of the bottle K, which now must be kept up with the hand, or other convenient support, as it cannot rest upon the bottom of the bason. The mixture of chalk, &c. in the bottle FG, will immediately begin to effervesce, showing a frothing, and an intestine motion accompanied with heat, that may be felt by applying the hand to the outside of the fluid. The elastic fluid called *fixed air* is copiously emitted from this mixture, and passing through the bent tube, will go into the bottle K, as appears by the bubbles which come out of the tube, and, passing

Plate X. fig. 1.

Cavallo on Air.

(A) Chalk, lime-stone, &c. after being kept in a very strong fire for many hours, if they are put into acids, yield a considerable quantity of fixed air; which shows that the purest quick-lime contains some fixed air.

sing through the water, ascend to the top of the inverted bottle. In proportion as the elastic fluid fills the bottle K, the water gradually descends, and at last is quite expelled from it; the bottle K then is filled with fixed air, and being corked under water, may be removed from the bason, and kept for use. Another bottle may then be filled with water, and may be inverted over the extremity of the bent tube in the place of K, which other bottle may be filled in a similar manner, and so on till the mixture in FG has finished to yield any fixed air.

If one of these bottles filled with fixed air be uncorked, and, holding it with the mouth upwards, a lighted wax taper, bent like L, or a small piece of it affixed to the extremity of a wire, be immediately let down in it, the flame will be instantly extinguished. The same thing will happen if a lighted piece of wood is let down in it.

Take a clean bowl, and putting the mouth of a bottle, filled with fixed air, in it, uncork it, and keep it in that situation for about a minute. The fixed air being specifically heavier than common air, will come out of the bottle, and will remain at the bottom of the bowl, whilst common air enters into the bottle; which bottle may now by removed; and, in order to show the real existence of the fixed air, which will immediately show its being heavier than common air, put a lighted wax-taper into the bowl, pretty near its bottom, which taper will be extinguished immediately. The air in this experiment must be agitated as little as it is possible. That the flame of the wax taper was really extinguished by the fixed air, may be easily proved in the following maner :—Blow once or twice into the bowl, by which means the fixed air will be expelled from it; and then, on letting down a lighted wax-taper in it as before, it will be found that it is no longer extinguished, but will burn very well, the bowl being now filled with common air. This experiment never fails of surprising the spectators, as it clearly exhibits two remarkable properties of a fluid, which they can neither see nor distinguish by the feeling.

Cavallo on Air.

When the bottle K is about half filled with fixed air, put a mark with a bit of soft wax on the outside of it, just coinciding with the level of the water in it, and immediately after shake the bottle; but taking care that its mouth be not lifted above the surface of the water in the bason. After having shaken it for about a minute, on intermitting the agitation, it will be found that the water is above the mark; which shows that some of the fixed air has been absorbed by it. Let this absorption be carried on as far as possible, by agitating the bottle repeatedly, and allowing time to let more fixed air be produced and enter into the bottle in proportion as the water absorbs it. Then apply the hand, or a finger, to the mouth of the bottle whilst under water; bring the bottle out, and turn it with the mouth upwards. The water then will be found to have acquired a pleasant acidulous taste. The water thus impregnated with fixed air changes the blue infusion of some vegetable substances into red; so that if a weak solution of heliotrope is mixed with it, or indeed if it is simply exposed to fixed air, the liquor acquires a reddish appearance. It also corrodes iron, and some other metals, much more easily than common water. But the greatest and most useful property of this acidulated water, or water impregnated with fixed air, is its being a powerful antiseptic. As the most used mineral waters are medicinal principally on account of their being impregnated with fixed air, besides which they generally contain some small portion of metal or salt dissolved; they may be imitated by impregnating water with fixed air and then adding that quantity of salt or of metal, that by analysis the original mineral waters are found to contain.

183 Useful properties of fixed air.

It is for its great property of hindering putrefaction, that fixed air by itself, or incorporated with various fluids, especially with water, and that vegetables, sugar, and other substances which abound with fixed air, are very powerful remedies in putrid diseases. Sir John Pringle supposes, with great probability, that the frequent use of sugar and vegetables, which at this time make up a considerable part of the diet of the European nations, prevents those putrid diseases and plagues which formerly were rather frequent.—Dr Macbride, showing experimentally that fixed air is discharged by such substances as form our common food, ascribes the preservation of the body from putrefaction in great measure to the fixed air, which in the ordinary process of digestion is disengaged from the aliment, and incorporates with the fluids of the body.

From the same property it may be also usefully applied to several œconomical purposes. Mr Henry found, that fixed air can preserve fruit for a considerable time. He tried a bunch of Italian grapes, which being suspended in the middle part of Dr Nooth's apparatus, and being supplied with plentiful streams of fixed air every day, was preserved without any signs of decay for about one month longer than a similar bunch suspended in a decanter containing common air. Strawberries and cherries he also found to be preserved without decay some days longer in fixed than in common air. Indeed fixed air preserves not only fruit, but resists putrefaction in general. Dr Macbride, in his elegant essays on Medical and Philosophical Subjects, has published various experiments which demonstrate this property of fixed air. He found, that not only good meat was preserved incorrupt for a considerable time, when exposed to fixed air; but that the putrefaction of substances actually putrid was impeded by this means, and even that those substances were restored from the putrescent to a sound state. 184

Resists putrefaction.

That putrefaction was checked by fermentation, was discoverd by Sir John Pringle; and Dr Macbride observed, that this effect was owing to the fixed air produced in the act of fermentation. But it must be observed, that when the sound, or even putrid substances, expose a very great surface to the fixed air, as is the case with milk, bile, and other fluids impregnated with fixed air, and also with small bits of meat, then they are preserved for a considerable time: but large pieces of solid animal substances, as for instance roundish pieces of flesh of about half a pound weight, do not seem to remain incorrupt much longer in fixed than in common air; at least the difference is inconsiderable. Sir William Lee, baronet, in two of his letters to Dr Priestley, informs him of his having found, that flesh-meat, even in the hot season, could be preserved wholesome for several days, by only washing it two or three times a-day in water impregnated with fixed

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fixed air. "We have been enabled," says he, "to preserve meat as perfectly sweet and good to the extent of ten days, as at the first killing: and there seems no doubt it might be preserved much longer." He has even recovered some meat that had begun to change. This useful discovery, Sir William justly observes, may be very beneficial to the public, especially to butchers. "Particularly a butcher," says he, "who deals pretty largely, assures me he found the greatest success from it, and only objects that the veal was a little discoloured though kept perfectly sweet."

Fixed air, as it combines with water, so it may be combined with other liquors. Beer, wine, and other fermented liquors, may be impregnated with fixed air, and by this means their sharpness may be restored, when they are become vapid, or as it is commonly said, *dead*. The acidulous taste communicated by the impregnation of fixed air, cannot be discovered in beer, wines, and, in short, in such liquors which have much taste of their own. Milk acquires an acidulous taste by being impregnated with fixed air, and is thereby preserved incorrupt for some days; which affords a very easy expedient of preserving milk in those places where it cannot be had new very often.

185 Production of inflammable air.

§ 2. *To produce* Inflammable *Air*.—The process for making this sort of gas is the same as that for making fixed air: one of the materials only must be different, viz. iron-filings, or grossly powdered zinc, must be used instead of chalk; to which filings some oil of vitriol and water must be added, in the same proportion as in the fixed air, or rather a little more of oil of vitriol.

N. B. Instead of the filings of iron, small nails, or small bits of iron-wire, answer equally well.

The inflammable elastic fluid produced by this mixture has a displeasing smell, even when mixed with a very large quantity of common air; so that if any considerable quantity of it comes out of the bottle, before the cork with the bent tube be applied to it, &c. its smell may be perceived all over the room in which the experiment is made, but this smell is not particularly offensive.

When a bottle has been filled with this elastic fluid, stop the mouth of it with your thumb, or any stopper, and taking it out of the bason, bring it near the flame of a candle; and when the mouth of the bottle is very near it, remove the stopper, and the elastic fluid contained in the bottle will be immediately inflamed; and if the capacity of the bottle is nearly equal to four ounce-measures, it will continue burning quietly for about half a minute, the flame gradually descending lower and lower, as far as about the middle of the bottle, in proportion as the inflammable gas is consumed.

In this experiment we see, that inflammable air follows the general rule of all other combustible substances, namely, that of burning only when in contact with common air: thus the flame of this gas, whilst burning, is observable only on that surface of it which is contiguous to the common air; so that if the bottle

186 Phenomena.

be closed, the flame is put out immediately, because the air is intercepted from it. But if the inflammable air were put in such a situation as to expose a very great surface to the common air, it is plain, that by this means its combustion would be accelerated, so as to let it burn instantly, and go off with an explosion, caused by the sudden rarefaction of the air. In fact, this effect may be easily observed in the following manner: When the bottle is to be inverted into the bason, in order to let it be filled with the inflammable gas, instead of filling it entirely with water, let half of it remain filled with common air; then invert it, and let the other half, which is now filled with water, be filled with inflammable air after the usual manner; and when the bottle is full, remove it in the manner shown above, and approach it to the flame of the candle, by which means the inflammable air takes fire; but now it explodes all at once with a large flame and a considerable report, sometimes breaking the bottle in which it is contained. In this case, the bottle being filled with equal parts of inflammable and common air, these two elastic fluids were mixed together, so that almost every particle of the one touched every particle of the other, and hence the sudden combustion was occasioned. The force of this explosion is so very considerable, that some pistols have been contrived, which are charged with a mixture of air and inflammable gas, and being fired by means of an electric spark, are capable to drive a leaden bullet with great violence. Sometimes those pistols are made of glass (but in this case they are not charged with a bullet), and it is very diverting to show that pistols are charged and explode by the combustion of an invisible substance.

When a slender pipe is tied to the neck of a bladder, and the bladder is filled with inflammable air, after the manner described in the preceding experiment (viz. when the bladder was required to be filled with fixed air), two very pleasing experiments may be performed with it. First, the inflammable gas may be inflamed by applying the flame of the candle to the extremity of the pipe; and squeezing at the same time the bladder, a stream of fire will be formed in the air, which will last as long as the bladder contains any inflammable air; for this gas coming out of the pipe with violence, will continue inflamed for a considerable way in the air. Secondly, the extremity of the pipe may be dipped into a solution of soap, then removing it from the solution, and squeezing the bladder very gently, a ball of soap-water may be formed, including inflammable air: which ball, on account of the inflammable gas being much lighter than common air, as soon as it is detached from the pipe will ascend upwards, and will break by dashing against the ceiling, contrary to those commonly made by children, which in still air go downwards.—Whilst the ball is ascending, if the flame of the candle be approached to it, the film of soap-water will be instantly broke, and the inflammable air will take fire; thus a flame may be shown to be seemingly produced from a soap-ball.

187 Inflammable air obtained from various substances.

By taking electric sparks in any kind of oil, spirit of wine, ether, or spirit of sal ammoniac, Dr Priestley obtained inflammable air. The oil, or other liquor, was confined in a glass tube by quicksilver, and a wire was cemented in the upper part of the tube, through which the sparks being sent, went to the quicksilver through the oil; but after that a few sparks had been taken, a quantity of inflammable air was generated, &c. Lest the production of inflammable air should be attributed to the cement which fastened the

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the wire, the Doctor repeated the experiment with ether in a glaſs ſyphon; but the inflammable air was generated as before. This elaſtic fluid does not loſe its inflammability by being paſſed ſeveral times from one veſſel into another through water.

Alkaline air, by taking electric exploſions in it, is changed into inflammable air.

By means of acids, inflammable air is obtained in greater abundance, and more readily. Iron, zinc, or tin, yield plenty of inflammable air when acted on by diluted vitriolic or marine acids.

If iron is put into ſtrong vitriolic acid, the quantity of elaſtic fluid that is produced is very little, except heat be applied to the phial, for then the production of elaſtic fluid is more copious; but this elaſtic fluid is vitriolic acid air, mixed with a ſmall portion of inflammable air, the proportional quantity of it being leſs when the acid is more concentrated.

Zinc treated after the ſame manner, produces the like effects, except that it gives more elaſtic fluid, without the application of heat, than iron does; and the greateſt part of the produced elaſtic fluid is inflammable.

In order to obtain the greateſt quantity of inflammable air from iron or zinc, the vitriolic acid muſt be diluted with much water, as about one part of ſtrong oil of vitriol to five or ſix parts of water. Dr Prieſtley found, that 11 grains of iron yielded $8\frac{1}{4}$ ounce-meaſures of inflammable air. According to Mr Cavendiſh, one ounce of zinc, diſſolved either in the vitriolic or marine acid, yields a quantity of inflammable air equal to the bulk of 356 ounces of water; one ounce of iron, diſſolved by means of vitriolic acid, yields a quantity of inflammable air equal to the bulk of 412 ounces of water; and one ounce of tin yields half as much inflammable air as iron does.

The ſolutions of iron, tin copper, lead and zinc, in the marine acid, produce marine acid air, and inflammable air, but in various quantities. The proportion of the former to the latter is as one to eight in iron, as one to ſix in tin, as three to one in copper and lead, and as one to 10 in zinc. Regulus of antimony, diſſolved in marine acid, with the application of heat, yields a ſmall quantity of elaſtic fluid, which is weakly inflammable.

Dr Prieſtley obtained inflammable air, not only by diſſolving various ſubſtances in marine acid, but alſo by expoſing divers bodies to marine acid air, which is probably the pureſt part of the marine acid. Having admitted iron-filings to this acid air, they were diſſolved by it pretty faſt; half of the elaſtic fluid diſappeared, and the reſt was rendered unabſorbable by water, and inflammable. The ſame effect was produced by almoſt every ſubſtance which contains phlogiſton, as by ſpirit of wine, oil of olives, ſpirit of turpentine, charcoal, phoſphorus, bees wax, ſulphur, dry-cork-wood, pieces of oak, ivory, pieces of roaſted beef, and even ſome pieces of a whitiſh kind of flint.

A greater or ſmaller portion of the acid air was abſorbed, and the reſt ſometimes was all inflammable, and often was partly acid air, which was ſoon abſorbed on the admiſſion of water, and partly inflammable. In ſhort, it ſeems as if this acid air, having a great affinity with phlogiſton, ſeparates it from all thoſe ſubſtances which contain it even in ſmall quantity, and from that combination becomes inflammable.

By means of nitrous acid, inflammable air may be obtained from various ſubſtances containing phlogiſton; but it is always mixed with nitrous air, and ſometimes alſo with fixed and common or phlogiſticated air. If two parts of ſpirit of wine, mixed with one part of nitrous acid, are put into a phial with a ground-ſtopple and tube, and the flame of a candle be applied to it, ſo as to heat it gradually, the inflammable air will be produced very readily; the inflammability of which is, however, not very permanent, for by a little waſhing in water it may be annihilated. In the ſolution of moſt ſubſtances in nitrous acid, it generally happens, that the elaſtic fluid, which is obtained towards the latter end of the proceſs, poſſeſſes the property of being inflammable: thus iron, diſſolved in nitrous acid, yields nitrous air; but when the nitrous air ceaſes to be produced, if the heat of a candle be applied to the ſolution, more elaſtic fluid will be produced which is inflammable. "The nitrous acid (ſays Dr Ingenhouz) when mixed with iron-filings in a very diluted ſtate, gives, by the aſſiſtance of a moderate degree of heat, a mixture of different airs, partly fixed, partly common air, and partly phlogiſticated air. See further the article AEROSTATION.

§ 3. *To produce* NITROUS *Air*.—This permanently elaſtic fluid is never found naturally, like fixed or inflammable air, but is entirely artificial. 188

Nitrous air is entirely artificial.

Either ſilver, copper, braſs, iron mercury, biſmuth, or nickel, when mixed with nitrous acid, yield nitrous air in great quantities. Some of them, eſpecially mercy, require the aid of heat in order to produce the elaſtic fluid; the flame of a candle applied to the phial is ſufficient: but others, eſpecially copper and iron, do not want the application of any heat. Gold platina, and the regulus of antimony, when put in aqua regia, yield nitrous air pretty readily. Among the metals, lead yields nitrous air in the ſmalleſt quantity. "I poured (ſays Dr. Prieſtly) ſmoking ſpirit of nitre into a phial with a ground-ſtopple and tube, containing $1\frac{1}{2}$ ounce-meaſure filled with ſmall leaden ſhot, ſo as to leave no common air at all, either in the phial or in the tube; and I placed it ſo as to receive the air that might come from it in water. 189

From what ſubſtances produced.

After waiting an hour, in which little or no air was produced, I applied the flame of a candle, though not very near, to it: and in theſe circumſtances I got about an ounce-meaſure of air: but upon ſome water ruſhing into the phial while the candle was withdrawn, air was produced very plentifully. I collected in all about a quarter of a pint; and might probably have got much more, but that the ſalt formed by the ſolution of the lead had ſo nearly cloſed up the tube, that I thought proper to diſcontinue the proceſs. The air, both of the firſt and of the laſt produce, was of the ſame quantity; and ſo far nitrous, that two meaſures of common air, and one of this, occupied the ſpace of two meaſures only; excepting that the very firſt and very laſt produce, mixed with common air, took up a little more room than that which I got in the middle of the proceſs. When the air was produced very faſt, it was exceedingly turbid, as if it had been filled with a white powder."

Among the ſemi-metals, zinc gives the weakeſt nitrous air, when diſſolved in nitrous acid. The elaſtic fluid

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fluid produced from it is mostly phlogisticated air. From four pennyweights and 17 grains of zinc, dissolved in spirit of nitre diluted with an equal quantity of water, Dr Priestley obtained about 12 ounce-measures of very weak nitrous air. It occasioned a very slight effervescence when mixed with common air. The Doctor obtained nitrous air even from some flowers of zinc. "Having (says he) mixed a quantity of blue spirit of nitre with flowers of zinc, which were of a dull colour, and appeared from several experiments to contain a portion of phlogiston, it yielded, with the heat of a candle applied to the phial which contained it, strong nitrous, air; when the common spirit of nitre, applied in the same manner, gave only phlogisticated air; the phlogiston of which came probably from the calx itself, though a small portion of it might have been in the nitrous acid, which I believe is never entirely free from it."

The quantity of nitrous air that may be obtained from various metals, is difficult to be ascertained, on account of the diversity occasioned by the strength of the acid, the various nature of the metallic substance, and the method of performing the experiments. The following is a table of the produce of nitrous air from various metals, extracted from Dr Priestley's first volume of Experiments and observations; but which, as the author himself intimates, is far from being very accurate.

dwt.	grs.		
6	0	of silver yielded	$17\frac{1}{2}$ ounce-measures.
5	19	of quicksilver,	$4\frac{1}{2}$
1	$2\frac{1}{2}$	of copper,	$14\frac{1}{2}$
2	0	of brass,	21
0	20	of iron,	
1	5	of bismuth,	6
0	12	of nickel,	4

The various strength of the nitrous acid produces great diversity in the production of nitrous air. Thus, if copper is dissolved in strong nitrous acid, it will not produce the least quantity of nitrous air; but when dissolved in diluted nitrous acid, it produces a great quantity of that elastic fluid. The strong and pale-coloured nitrous acid should be diluted with at least two or three parts of water to one of the acid, for the easy production of nitrous air from copper and mercury.

The briskness of the effervescence, and the production of nitrous air, are promoted by heat, and also by letting the metallic substance present a great quantity of surface to the acids.

For the generality of experiments, no other degree of heat is required than that produced by the effervescence itself, except mercury be used, which requires the application of some heat. When the metal exhibits a very great surface to the acid, as is the case when filings are used, the effervescence and production of nitrous air are often much quicker than can be conveniently managed.

Copper or brass, when clipped into flat bits, each about two or three grains in weight, and about a quarter of a square inch in surface, and when dissolved in nitrous acid properly diluted, yield nitrous air very equably; but if iron be used, the pieces of it should be larger and fewer; in short, it should present a much less surface to the diluted acid; otherwise the increase of heat in the process, and the rapid production of elastic fluid, render the operation both difficult and dangerous for the operator.

190 Pure mercury yields the best.

As the nitrous air is mostly necessary to try the goodness of respirable air, it is of great consequence to make it always of one constant degree of goodness; but this object is answered by dissolving substances of a very homologous nature in the nitrous acid; therefore it is plain, that the metals whose nature is more uniform must be preferred for this purpose. Accordingly, brass yields nitrous air of a more uniform nature than iron: copper is superior to brass; but pure mercury is still superior to copper: and indeed this is the metal which, considering its nature, uniformity of substance, and easy solution, is upon the whole the most useful for this purpose.

It has been generally observed, that solid vegetable substances, when dissolved in nitrous acid, yield more nitrous air than the animal substances, though this nitrous air is not so pure as that obtained from metals.

Sometimes it contains some fixed air, and a good deal of inflammable air which is mostly produced towards the end of the process. On the other hand, the nitrous air, extracted from animal substances generally contains a good deal of phlogisticated air, and sometimes some fixed air. In order to obtain nitrous air from the solution of animal and vegetable substances in nitrous acid, often some degree of heat must be applied to the phial. The acid also sometimes must be very concentrated, and in other cases it must be diluted; but it is hardly worth while, or practicable, to determine with exactness all those particular cases.

To make Nitrous Air.—The metal, viz. copper, brass or mercury, is first put into the bottle (which, as well as the whole process, is the same as that described for *fixed Air*), so as to fill about one-third of the same; then some water is poured into the bottle, so as just to cover the metal-filings; and lastly, the nitrous acid is added, the quantity of which, when strong, should be about one-third or half the quantity of the water. The smell of the nitrous gas is very penetrating and offensive, and occasions a red smoke as soon as it comes into contact with the common air; hence whenever any of it escapes from the bottle, it may be observed not only by the smell, but also by the slight red colour.

In order to observe the principal property of this elastic fluid, which is that of diminishing the bulk of common air, let a glass tube, closed at one end, and about nine inches long, and half or three quarters of an inch in diameter, be filled with water, and inverted in water; then take a small phial, of about half an ounce-measure, filled with common air, and plunging it under the water contained in the same bason where the inverted tube is kept, let that quantity of air enter into the tube, which will go to the top of it, the water subsiding accordingly. Let a mark be made, either with a file or by sticking soft wax on the tube, just opposite to the surface of the water in it, which will mark how much the tube is filled by that given measure of air. After the same manner, fill the same small phial (which we shall call the *measure*) again with air; throw that air into the tube, and put a mark on the tube coinciding with the level of the water in it. In this manner, let four or five measures be marked on the tube. Now, if three measures of common air are put

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put into this tube, when filled with water and inverted, they will fill a ſpace of it as far as the third mark. The ſame thing will happen if three meaſures of nitrous inſtead of common air be put in it; but if two meaſures of common air and one meaſure of nitrous air, or one meaſure of the former and two of the latter, be introduced in it, they will fill a ſpace much ſhorter than the third mark. On the moment that theſe two kinds of elaſtic fluids come into contact, a reddiſh appearance is perceived, which ſoon vaniſhes, and the water, which at firſt nearly reaches the third mark, riſes gradually into the tube, and becomes nearly ſtationary after about two or three minutes; which ſhows that the diminution is effected gradually. See Eudiometer.

§ 4. *To procure* Dephlogisticated *Air*.—This is no other than exceedingly pure atmoſpherical air, entirely free from thoſe heterogeneous vapours which contaminate the air we commonly breathe. The eaſieſt method of procuring this air is to put ſome red-lead into the bottle, together with ſome good ſtrong oil of vitriol, but without any water. Let the red-lead fill about a quarter of the bottle, and the vitriolic acid be about the ſame quantity or very little leſs; then apply the bent tube to the bottle, and proceed in the ſame manner as above. But it muſt be remarked, that without heat this mixture of red-lead and vitriolic acid will not give any dephlogiſticated air, or it yields an inconſiderable quantity of it; for which reaſon the flame of a candle (that of a wax taper is ſufficient) muſt be applied under the bottom of the bottle; which for this purpoſe muſt be rather thin, otherwiſe it will be eaſily cracked (A). In this manner the red-lead will yield a good quantity of elaſtic fluid, the greateſt part of which is dephlogiſticated air; but not the whole quantity of it, for a good portion of fixed air comes out with it. In order to ſeparate the fixed air from the dephlogiſticated air, the inverted bottle, when filled with the compound of both, as it is emitted from the red-lead, muſt be ſhook in the baſon for impregnating water with fixed air; by which means the water will abſorb the whole quantity of fixed air, and leave the dephlogiſticated air by itſelf.

From every experiment it appears, that dephlogiſticated air, if it could readily be obtained, and at a cheap rate, would be a moſt valuable manufacture. The heat communicated by means of it to burning fuel is incredible.

Theſe are not the only advantages which might be expected from dephlogiſticated air. It has been found by experience, that animals will live much longer in this kind of air than in an equal quantity of common air; whence it is ſuppoſed, that the breathing of it muſt be much more healthy, and contribute to longevity much more than the common atmoſphere. Nay, there are not wanting ſome who attribute the longevity of the Antediluvians to the great purity of the atmoſphere at that time; the whole maſs being afterwards tainted by the deluge, in ſuch a manner that it could never regain its former purity and ſalubrity. But all this as yet is mere conjecture; and excepting the ſingle fact, that animals live much longer in a quantity of dephlogiſticated than of common air, there is no evidence that the former contributes more to longevity than the latter. Dr Prieſtley even throws out a conjecture, that the uſe of dephlogiſticated air might perhaps wear out the ſyſtem much ſooner than common air, in the ſame manner as it conſumes fuel much faſter than common air. The great quantity, however, even of the pureſt air, which is requiſite to ſupport animal life, and the expence and trouble of the moſt ready methods of procuring it, have hitherto prevented any fair trial from being made. Yet philoſophers, conſidering the probability there is of this kind of air being ſalutary in many diſeaſes, having beſtowed ſome pains in attempting to find out methods of procuring it eaſily and in large quantity; concerning which we have the following obſervations in Cavallo's Treatiſe on Air.

"A man makes in general about 15 inſpirations in a minute, and takes in about 30 cubic inches of aërial fluid. But the air which has been once inſpired is not thereby much injured, and it may be reſpired again and again; ſo that upon a very moderate calculation, and as appears from actual experiments often repeated, we may ſafely aſſert, that a perſon can breathe 400 cubic inches of good ordinary atmoſpheric air, at leaſt 30 times, without any inconvenience, i. e. it would ſerve for two minutes; after which that air, though much depraved, is ſtill in a ſtate of being breathed, but then it would occaſion ſome uneaſineſs. Now, ſuppoſing the dephlogiſticated air employed to be four times more pure than common air, 400 cubic inches of dephlogiſticated air would ſerve for at leaſt 120 reſpirations or eight minutes.

"But ſuppoſing that 30 inches of common air are completely phlogiſticated by a ſingle inſpiration, and changed for ſuch as is quite freſh, which indeed is the caſe in common reſpiration, then 450 cubic inches of common air will be requiſite for one minute's reſpiration, and 27,000 for one hour; and as dephlogiſticated air is ſuppoſed to be four times as good, the ſame quantity of it will ſerve for four hours. Indeed, if we could depend on the aſſertions of Mr Fontana, that by adding lime-water to abſorb the fixed air produced by reſpiration, an animal can live 30 times as long as without it, no doubt a much ſmaller quantity would ſerve."

But it is certain ſuch aſſertions cannot be true; becauſe, though the fixed air ſhould be abſorbed as ſoon as produced, the remaining quantity would ſtill be contaminated by phlogiſton. Nay, we are informed by Dr Prieſtley, who repeated Fontana's experiments, that

(A) In this operation the flame of the candle, when once applied, muſt be kept continually near it; and when the mixture does not produce any more elaſtic fluid, or the operation is required to be intermitted, care ſhould be taken to remove the extremity of the bent tube from the water firſt, and then to take off the flame of the candle from under the bottle; otherwiſe, if the flame of the candle be firſt removed, the materials within the bottle condenſing by cold, the water immediately enters, which in an inſtant fills the bottle, and generally breaks it.

that animals *will not* live longer in a quantity of dephlogisticated air when it stands in contact with lime-water, than they will when no lime-water is used. In what manner a difference so enormous can take place, between philosophers in other respects so accurate, we can by no means determine. It is plain, however, that if 27,000 inches of common air are necessary for a person in one hour, the same quantity of dephlogisticated air cannot be breathed longer than four hours, nor even so long with any real advantage. Mr Cavallo indeed allows only 12,000 inches for four hours; but though this might no doubt sustain life for that time, the person must at best expect nothing from it superior to the common atmosphere, if he was not materially injured by it.

A very ready method of procuring dephlogisticated air in large quantity, is by means of nitre; and on the supposition that 12,000 inches are sufficient for four hours, (or for 40 hours, as he limits the Abbé Fontana's supposition), Mr Cavallo proceeds in the following manner: "The instruments necessary for the production of dephlogisticated air from nitre are the following; viz. earthen retorts, or earthen vessels with a straight neck, somewhat in the shape of Florence flasks, but with a longer neck, these being cheaper than the retorts, and answering as well;—a small furnace, in which the earthen retort must be kept red-hot; a common chimney fire is not sufficient. These furnaces may be very easily made out of large black lead crucibles. The nitre must be put into the retort or other vessel, so as to fill half or nearly three quarters of its belly; then a bent glass tube is luted to the neck of the earthen vessel, in such a manner as not to let any elastic fluid escape into the open air. The best lute or cement for this or similar purposes is made by mixing together whiting and drying oil. The retort being put into the furnace, must be surrounded with lighted charcoal, which is to be supplied according as it wastes: in short, the belly of the retort must be kept quite red-hot, or rather white-hot, for about three hours at least. If, instead of the retort, the other described earthen vessel be used, care should be had to place it with the neck as little inclined to the horizon as possible, lest the nitre should stop the neck and break it." The air is then to be received into large glass jars, as is usual in other experiments on air.

"The retort or other earthen vessel that is used for this purpose cannot serve for more than once, because it generally breaks in cooling; and besides, the decomposed nitre cannot easily be taken out of it. The retort capable of holding a pound of nitre (the quantity necessary for producing 12,000 cubic inches of dephlogisticated air) for this operation, costs at least half-a-crown; the other earthen vessels in the shape of Florence flasks, but with longer necks, cost about 18d. a-piece, or 2s.; so that the price of these vessels forms a considerable part of the expence. If glass vessels are employed, the nitre will not yield near so much air, though of a purer sort, because the glass vessels cannot endure such a great fire as the earthen ones. The retorts of metal, or at least of these metals which are most usually employed for this purpose, viz. iron and copper, phlogisticate in a great measure the air as soon as produced. Considering, then, all these circumstances, it appears, that when a person has all the usual apparatus and furnace, the expences at present necessary in London for the production of 12,000 cubic inches of dephlogisticated air, (viz. the price of one pound of nitre, of an earthen retort or other vessel, and of charcoal), amount to about 4s. or 4s. 6d."

Another method of preparing dephlogisticated air is, by blowing that of the common atmosphere thro' melted nitre. In this process the phlogiston contained in the atmosphere is gradually consumed, by detonating with the acid of the nitre, and therefore issues much more pure than before. This method has the appearance at first of being much easier and more commodious than the former; but as it is impossible to mix the atmospheric air so exactly with the melted nitre that every particle of the one may come in contact with every particle of the other, it is plain that the former method must be preferable; not to mention that it will be found exceedingly troublesome to blow the air through the nitre, as the latter will be perpetually apt to cool and concrete into lumps by the cold blast.

§ 5. *To procure* Vitriolic *Acid Air*.—This consists of the vitriolic acid, united with some phlogiston, which volatilizes and renders it capable of assuming the form of a permanently elastic fluid. To obtain it, some strong concentrated vitriolic acid must be put into the usual bottle, together with some substance capable of furnishing phlogiston. Olive oil answers very well. The oil of vitriol should be about three or four times as much as the sweet oil, and both together should fill about one-third or half the bottle. A gentle degree of heat is then required, in order to let these materials yield any elastic fluid; which may be done by applying the flame of a wax taper, as directed above for the production of dephlogisticated air.

§ 6. *To procure* Marine *Acid Air*, which is no other than the marine acid itself, and which without any addition becomes a permanently elastic fluid; put some sea-salt, or common kitchen salt, into the usual bottle in which the materials for producing elastic fluids are generally put, so as to fill about a fourth part of it, and upon this salt pour a small quantity of good concentrated vitriolic acid; then apply the bent tube to the bottle, and introduce it through the quicksilver into the receiver, filled with and inverted in quicksilver after the usual method, and the elastic fluid is copiously produced.

§ 7. *To procure* Nitrous *Acid Air*.—This may be obtained from heated nitrous acid, the vapour of which acquires a permanent elasticity, and it has been found to remain uncondensed into a visible fluid by any cold to which it has been hitherto exposed. The great difficulty is to find a fluid capable of confining this acid air; because it is easily and abundantly absorbed by water, which is one of its properties by which it differs from nitrous air. It acts upon quicksilver, and also upon oils: hence its examination cannot be made but very imperfectly; for substances must be exposed to it, or mixing with it, whilst it is actually changing its nature by acting on the mercury or other fluid that confines it.

When water has absorbed a good quantity of this elastic fluid, it acquires the properties of nitrous acid; and when heated, it yields a large quantity of nitrous air, Of Artificial Air. air, viz. a quantity many times greater than that which water is wont to imbibe of it by agitation, or by any known means.

When the nitrous acid air is combined with essential oils, a considerable effervescence and heat are produced, nearly in the same manner as when the nitrous acid itself is poured upon those oils.

§ 8. *Fluor Acid Air.*—Put some of those minerals called *fluors*, or *fusible spars*, pulverized into the usual bottle, and upon it pour some concentrated oil of vitriol; then adapt the bent tube, &c. The fluor acid air is at first produced without the help of heat: but in a short time it will be necessary to apply the flame of a candle to the bottle, by which means a considerable quantity of this elastic fluid is obtained.

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§ 9. *Alkaline Air.*—Let the usual bottle be about half filled with volatile spirit of sal ammoniac; and after applying the bent tube, &c. let the flame of a candle be brought under the bottle, by which means the alkaline air will be produced copiously.

Hepatic Air. See Sect. XI. *supra*.

I N D E X.

Aeromancy ‖ Aeronautica.

AEROMANCY, a ſpecies of divination performed by means of air, wind, &c. See DIVINATION, nº 5.

AEROMETRY, the ſcience of meaſuring the air. It comprehends not only the doctrine of the air itſelf, conſidered as a fluid body; but alſo its preſſure, elaſticity, rarefaction, and condenſation. But the term is at preſent not much in uſe, this branch of natural philoſophy being more frequently called Pneumatics. See PNEUMATICS.

AERONAUT, a perſon who attends and guides an air-balloon. See AEROSTATION and AIR-*Balloon*.

AERONAUTICA, from ἀηρ and ναυτικος, derived from ναυς, ſhip; the art of ſailing in a veſſel or machine through the atmoſphere, ſuſtained as a ſhip in the ſea. See AEROSTATION.

Aerophylacea.

AEROPHYLACEA, a term uſed by naturaliſts for caverns or reſervoirs of air, ſuppoſed to exiſt in the bowels of the earth. Kircher ſpeaks much of aerophylacea, or huge caverns, replete with air, diſpoſed under ground; from whence, through numerous occult paſſages, that element is conveyed either to ſubterraneous receptacles of water, which, according to him, are hereby raiſed into ſprings or rivers, or into the funds of ſubterraneous fire, which are hereby fed and kept alive for the preparation of metals, minerals, and the like.

AEROSTATION

IS a science newly introduced into the Encyclopædia. The word, in its primitive sense, denotes the science of suspending weights in the air; but in its modern acceptation, it signifies *aerial navigation*, or the art of navigating through the atmosphere. Hence also the machines which are employed for this purpose are called *aerostats*, or *aerostatic* machines; and from their globular shape, *air-balloons*.

The romances of almost every nation have recorded instances of persons being carried through the air, both by the agency of spirits and by mechanical inventions;

1 Lord Bacon first published the true principles of aerostation.

but till the time of the celebrated Lord Bacon, no rational principle appears to have been thought of by which this might be accomplished. Before that time, indeed, Friar Bacon had written upon the subject; and many had been of opinion, that, by means of artificial wings, fixed to the arms or legs, a man might fly as well as a bird: but these opinions were thoroughly

2 Impossibility of flying by mechanical means.

refuted by Borelli in his treatise *De Motu Animalium*, where, from a comparison between the power of the muscles which move the wings of a bird, and those which move the arms of a man, he demonstrates that the latter are utterly insufficient to strike the air with such force as to raise him from the ground. It cannot be denied, however, that wings of this kind, if properly constructed, and dexterously managed, might be sufficient to break the fall of a human body from an high place, so that some adventurers in this way might possibly come off with safety; though by far the greatest number of those who have rashly adopted such schemes, have either lost their lives or limbs in the attempt.

3 Scheme of Bishop Wilkins and Albertus de Saxonia.

In the year 1672, Bishop Wilkins published a treatise, intitled, the Discovery of the New World; in which he mentions, though in a very indistinct and confused manner, the true principle on which the air is navigable; quoting, from Albertus de Saxonia and Francis Mendoca, "that the air is in some part of it navigable: and upon this static principle, any brass or iron vessel (suppose a kettle), whose substance is much heavier than that of water, yet being filled with the lighter air, it will swim upon it and not sink. So suppose a cup or wooden vessel upon the outward borders of this elementary air, the capacity of it being filled with fire, or rather ethereal air, it must necessarily, upon the same ground, remain swimming there, and of itself can no more fall than an empty ship can sink." This idea, however, he did not by any means pursue, but rested his hopes entirely upon mechanical motions, to be accomplished by the mere strength of a man, or by springs, &c. and which have been demonstrated incapable of answering any useful purpose.

4 Bishop Lana's scheme.

The only person who brought his scheme of flying to any kind of rational principle was the Jesuit Francis Lana, cotemporary with Bishop Wilkins. He, being acquainted with the real weight of the atmosphere, justly concluded, that if a globular vessel were exhausted of air, it would weigh less than before; and considering that the solid contents of vessels increase in much greater proportion than their surfaces; he supposed that a metalline vessel might be made so large, that, when emptied of its air, it would be able not only to raise itself in the atmosphere, but to carry up passengers along with it; and he made a number of calculations necessary for putting the project in execution. But though the theory was here unexceptionable, the means proposed were certainly insufficient to accomplish the end: for a vessel of copper, made so thin as was necessary to make it float in the atmosphere, would be utterly unable to resist the external pressure; which being demonstrated by those skilled in mechanics, no attempt was made on that principle.

5 Strange proposal of Friar Gusman.

In the year 1709, however, as we were informed by a letter published in France in 1784, a Portuguese projector, Friar Gusman, applied to the king for encouragement to his invention of a flying machine. The principle on which this was constructed, if indeed it had any principle, seems to have been that of the paper kite. The machine was constructed in form of a bird, and contained several tubes through which the wind was to pass, in order to fill a kind of sails, which were to elevate it; and when the wind was deficient, the same effect was to be performed by means of bellows concealed within the body of the machine. The ascent was also to be promoted by the electric attraction of pieces of amber placed in the top, and by two spheres inclosing magnets in the same situation.

These childish inventions show the low state of science at that time in Portugal, especially as the king, in order to encourage him to farther exertions in such an useful invention, granted him the first vacant place in his college of Barcelos or Santarem, with the first professorship in the University of Coimbra, and an annual pension of 600,000 reis during his life. Of this De Gusman, it is also related, that in the year 1736, he made a wicker basket of about seven or eight feet diameter, and covered with paper, which raised itself about 200 feet in the air, and the effect was generally attributed to witchcraft.

6 Possibility of bodies rising in the air thought of by Dr Black and Mr Cavallo.

In the year 1766, Mr Henry Cavendish ascertained the weight and other properties of inflammable air, determining it to be at least seven times lighter than common air. Soon after which, it occurred to Dr Black, that perhaps a thin bag filled with inflammable air might be buoyed up by the common atmosphere; and he thought of having the allantois of a calf prepared for this purpose: but his other avocations prevented him from prosecuting the experiment. The same thought occurred some years afterwards to Mr Cavallo; and he has the honour of being the first who made experiments on the subject. He first tried bladders; but the thinnest of these, however well scraped and prepared, were found too heavy. He then tried Chinese paper; but that proved so permeable, that the vapour passed through it like water through a sieve. His experiments, therefore, made in the year 1782, proceed-

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ed no farther than blowing up soap-bubbles with inflammable air, which ascended rapidly to the ceiling, and broke against it.

7 Aerostation discovered by Monf. Montgolfier.

But while the discovery of the art of aerostation seemed thus on the point of being made in Britain, it was all at once announced in France, and that from a quarter whence nothing of the kind was to have been expected. Two brothers, Stephen and John Montgolfier, natives of Annonay, and masters of a considerable paper manufactory there, had turned their thoughts towards this project as early as the middle of the year 1782. The idea was first suggested by the natural ascent of the smoke and clouds in the atmosphere; and their design was to form an artificial cloud, by inclosing the smoke in a bag, and making it carry up the covering along with it. Towards the middle of November that year, the experiment was made at Avignon with a fine silk bag of a parallelopiped shape. By applying burning paper to the lower aperture, the air was rarefied, and the bag ascended in the atmosphere, and struck rapidly against the ceiling. On repeating the experiment in the open air, it rose to the height of about 70 feet.

8 Account of his experiments.

An experiment on a more enlarged scale was now projected; and a new machine, containing about 650 cubic feet, was made, which broke the cords that confined it, and rose to the height of about 600 feet. Another of 35 feet in diameter rose about 1000 feet high, and fell to the ground three quarters of a mile from the place where it ascended. A public exhibition was next made on the fifth of June 1783, at Annonay, where a vast number of spectators assembled. An immense bag of linen, lined with paper, and containing upwards of 23,000 cubic feet, was found to have a power of lifting about 500 pounds, including its own weight. The operation was begun by burning chopped straw and wool under the aperture of the machine, which immediately began to swell; and after being set at liberty, ascended into the atmosphere. In ten minutes it had ascended 6000 feet; and when its force was exhausted, it fell to the ground at the distance of 7668 feet from the place from whence it set out.

Soon after this, one of the brothers arrived at Paris, where he was invited by the Academy of Sciences to repeat his experiments at their expence. In consequence of this invitation, he constructed, in a garden in the Fauxbourg of St Germain, a large balloon of an elliptical form. In a preliminary experiment, this machine lifted up from the ground eight persons who held it, and would have carried them all off if more had not quickly come to their assistance. Next day the experiment was repeated in presence of the members of the academy; the machine was filled by the combustion of 50 pounds of straw made up in small bundles, upon which about 12 pounds of chopped wool were thrown at intervals. The usual success attended this exhibition: The machine soon swelled; endeavoured to ascend; and immediately after sustained itself in the air, together with the charge of between 4 and 500 pounds weight. It was evident that it would have ascended to a greater height; but as it was designed to repeat the experiment before the king and royal family at Versailles, the cords by which it was tied down was not cut. But in consequence of a violent rain and wind which happened at this time, the machine was so far damaged, that it became necessary to prepare a new one for the time that it had been determined to honour the experiment with the royal presence; and such expedition was used, that this vast machine, of near 60 feet in height and 43 in diameter, was made, painted with water-colours both within and without, and finely decorated, in no more than four days and four nights. Along with this machine was sent a wicker cage, containing a sheep, a cock, and a duck, which were the first animals ever sent through the atmosphere. The full success of the experiment was prevented by a violent gust of wind which tore the cloth in two places near the top before it ascended: However, it rose to the height of 1440 feet; and, after remaining in the air about eight minutes, fell to the ground at the distance of 10,200 feet from the place of its setting out. The animals were not in the least hurt.

9 Some animals safely sent thro' the air.

10 Mr Pilatre de Rozier the first aerial navigator.

The great power of these aerostatic machines, and their very gradual descent in falling to the ground, had originally showed that they were capable of transporting people through the air with all imaginable safety; and this was further confirmed by the experiment already mentioned. As Mr Montgolfier, therefore, proposed to make a new aerostatic machine, of a firmer and better construction than the former, Mr Pilatre de Rozier offered himself to be the first aerial adventurer.

This new machine was constructed in a garden in the Fauxbourg of St Antoine. It was of an oval shape, about 48 feet in diameter and 74 in height; elegantly painted on the outside with the signs of the zodiac, ciphers of the king's name, and other ornaments. A proper gallery, grate, &c., were appended in the manner afterwards described; so that it was easy for the person who ascended to supply the fire with fuel, and thus keep up the machine as long as he pleased. The weight of the whole apparatus was upwards of 1600 pounds. The experiment was performed on the 15th of October 1783. Mr Pilatre having placed himself in the gallery, the machine was inflated, and permitted to ascend to the height of 84 feet, where he kept it afloat for about four minutes and a half; after which it descended very gently: and such was its tendency to ascend, that it rebounded to a considerable height after touching the ground. Two days after, he repeated the experiment with the same success as before; but the wind being strong, the machine did not sustain itself so well as formerly. On repeating the experiment in calmer weather, he ascended to the height of 210 feet. His next ascent was 262 feet; and in the descent, a gust of wind having blown the machine over some large trees of an adjoining garden, Mr Pilatre suddenly extricated himself from so dangerous a situation, by throwing some straw and chopped wool on the fire, which raised him at once to a sufficient height. On descending again, he once more raised himself to a proper height by throwing straw on the fire. Some time after, he ascended in company with Mr Girond de Villette to the height of 330 feet; hovering over Paris at least nine minutes in sight of all the inhabitants, and the machine keeping all the while perfectly steady.

11 Account of his different voyages.

These experiments had shown, that the aerostatic machines might be raised or lowered at the pleasure of the

the persons who ascended: they had likewise discovered, that the keeping them fast with ropes was no advantage; but, on the contrary, that this was attended with inconvenience and hazard. On the 21st of November 1783, therefore, M. Pilatre determined to undertake an aerial voyage in which the machine should be fully set at liberty. Every thing being got in readiness, the balloon was filled in a few minutes: and M. Pilatre placed himself in the gallery, counterpoised by the Marquis d'Arlandes, who occupied the other side. It was intended to make some preliminary experiments on the ascending power of the machine: but the violence of the wind prevented this from being done, and even damaged the balloon essentially: so that it would have been entirely destroyed had not timely assistance been given. The extraordinary exertions of the workmen, however, repaired it again in two hours, and the adventurers set out. They met with no inconvenience during their voyage, which lasted about 25 minutes; during which time they had passed over a space of above five miles.—From the account given by the Marquis d'Arlandes, it appears that they met with several different currents of air; the effect of which was, to give a very sensible shock to the machine, and the direction of the motion seemed to be from the upper part downwards. It appears also that they were in some danger of having the balloon burnt altogether; as the Marquis observed several round holes made by the fire in the lower part of it, which alarmed him considerably, and indeed not without reason. However the progress of the fire was easily stopped by the application of a wet spunge, and all appearance of danger ceased in a very short time.

12 Montgolfier's machines superseded by those filled with inflammable air.

This voyage of M. Pilatre and the Marquis d'Arlandes may be said to conclude the history of those aerostatic machines which are elevated by means of fire; for though many other attempts have been made upon the same principle, most of them have either proved unsuccessful or were of little consequence. They have therefore given place to the other kind, filled with inflammable air; which, by reason of its smaller specific gravity, is both more manageable, and capable of performing voyages of greater length, as it does not require to be supplied with fuel like the others. This was invented a very short time after the discovery had been made by M. Montgolfier. This gentleman had indeed designed to keep his method in some degree a secret from the world; but as it could not be concealed, that a bag filled with any kind of fluid lighter than the common atmosphere would raise in it, inflammable air was naturally thought of as a proper succedaneum for the rarefied air of M. Montgolfier.

13 Experiment of Messrs Charles and Roberts.

The first experiment was made by two brothers Messrs Roberts, and M. Charles a professor of experimental philosophy. The bag which contained the gas was composed of lutestring, varnished over with a solution of the elastic gum called *caoutchouc;* and that with which they made their first essay was only about 13 English feet in diameter. Many difficulties occured in filling it with the inflammable air, chiefly owing to their ignorance of the proper apparatus; insomuch, that, after a whole day's labour from nine in the morning, they had got the balloon only one third part full. Next morning they were surprised to find that it had fully inflated of itself during the night: but upon inquiry, it was found, that they had inadvertently left open a stop-cock connected with the balloon, by which the common air gaining access, had mixed itself with the inflammable air; forming a compound still lighter than the common atmosphere, but not sufficiently light to answer the purposes of aerostation. Thus they were obliged to renew their operation; and, by six o'clock in the evening of next day, they found the machine considerably lighter than the common air; and, in an hour after, it made a considerable effort to ascend. The public exhibition, however, had been announced only for the third day after; so that the balloon was allowed to remain in an inflated state for a whole day; during which they found it had lost a power of ascent equal to about three pounds, being one seventh part of the whole. When it was at last set at liberty, after having been well filled with inflammable air, it was 35 pounds lighter than an equal bulk of common air. It remained in the atmosphere only three quarters of an hour, during which it had traversed 15 miles. Its sudden descent was supposed to have been owing to a rupture which had taken place when it had ascended the higher regions of the atmosphere.

14 In what manner a balloon partly filled may inflate itself.

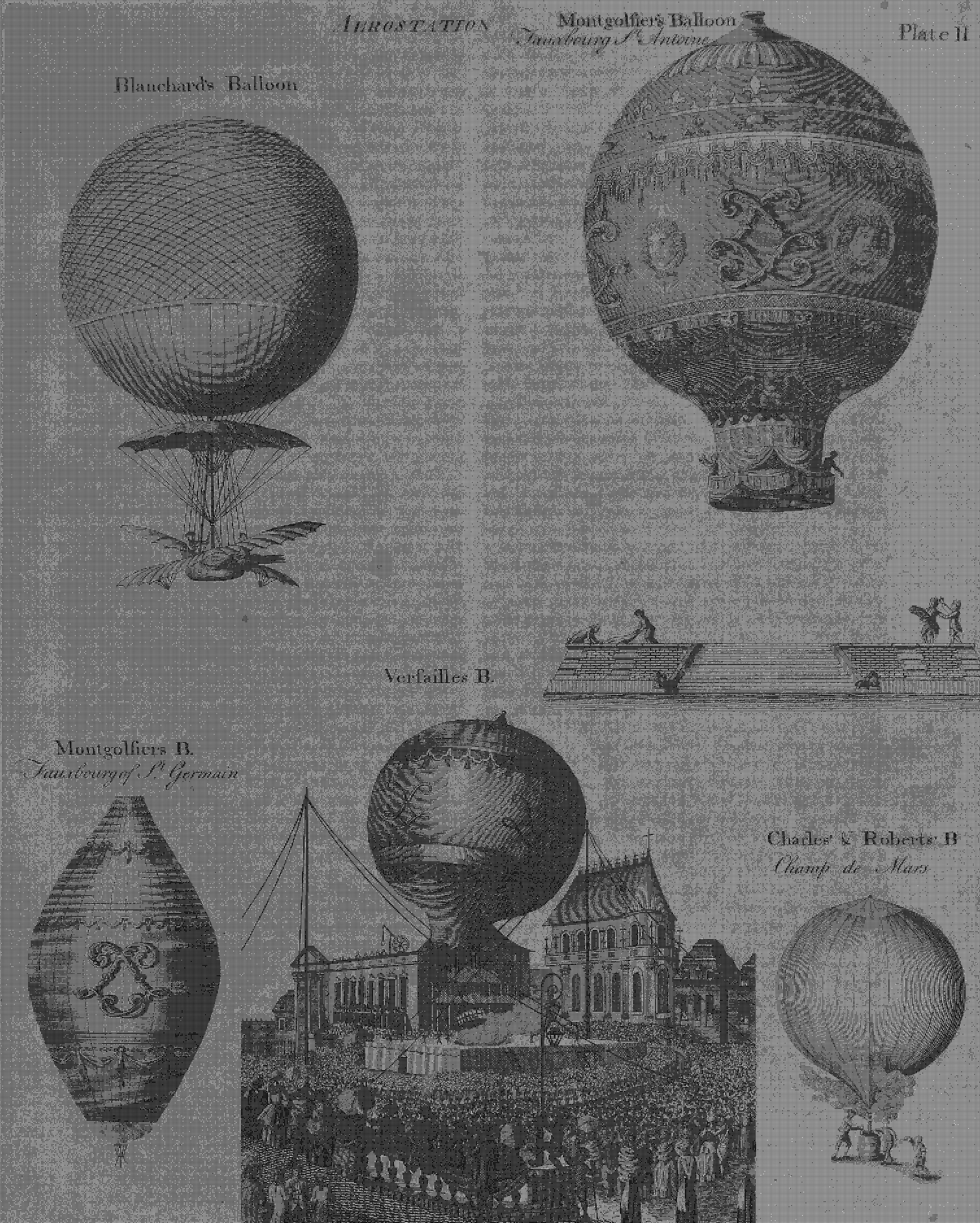
15 Loss of power in their balloon.

16 First aerial voyage of Messrs. Charles and Roberts.

The success of this experiment, and the aerial voyage made by Messrs Rozier and Arlandes, naturally suggested the idea of undertaking something of the same kind with a balloon filled with inflammable air. The machine used on this occasion was formed of gores of silk, covered over with a varnish made of *caoutchouc*, of a spherical figure, and measuring $27\frac{1}{2}$ feet in diameter. A net was spread over the upper hemisphere, and was fastened to an hoop which passed round the middle of the balloon. To this a sort of car, or rather boat, was suspended by ropes, in such a manner as to hang a few feet below the lower part of the balloon; and, in order to prevent the bursting of the machine, a valve was placed in it; by opening of which some of the inflammable air might be occasionally let out. A long silken pipe communicated with the balloon, by means of which it was filled. The boat was made of basket work, covered with painted linen, and beautifully ornamented; being 8 feet long, 4 broad, and $3\frac{1}{2}$ deep; it weight 130 pounds. At this time, however, as at the former, they met with great difficulties in filling the machine with inflammable air, owing to their ignorance of the most proper apparatus. But at last, all obstacles being removed, the two adventurers took their seats at three quarters after one in the afternoon of the first of December 1783. Persons skilled in mathematics were conveniently stationed with proper instruments to calculate the height, velocity, &c. of the balloon. The weight of the whole apparatus, including that of the two adventurers, was found to be $604\frac{1}{2}$ pounds, and the power of ascent when they set out was 20 pounds; so that the whole difference betwixt the weight of this balloon and an equal bulk of common air was 624 pounds. But the weight of common atmosphere displaced by the inflammable gas was calculated to be 771 pounds, so that there remains 147 for the weight of the latter; and this calculation makes it only $5\frac{1}{4}$ times lighter than common air.

17 Specific gravity of the inflammable air in this first voyage.

At the time the balloon left the ground, the thermometer stood at 9° of Fahrenheit's scale, and the quicksilver, in the barometer at 30.18 inches; and, by means


AEROSTATION
Montgolfier's Balloon
Fauxbourg St Antoine
Plate II
Blanchard's Balloon
Verfailles B.
Montgolfiers B.
Fauxbourg of St Germain
Charles' & Roberts' B
Champ de Mars
R. Scot Sculp. Philad.

means of the power of ascent with which they left the ground, the balloon rose till the mercury fell to 27 inches, from whence they calculated their height to be about 600 yards. By throwing out ballast occasionally as they found the machine descending by the escape of some of the inflammable air, they found it practicable to keep at pretty near the same distance from the earth during the rest of their voyage; the quicksilver fluctuating between 27 and 27.65 inches, and the thermometer between 53° and 57°, the whole time. They continued in the air for the space of an hour and three quarters, when they alighted at the distance of 27 miles from Paris; having suffered no inconvenience during their voyage, nor experienced any contrary currents of air, as had been felt by Messrs Pilatre and Arlandes.

18
Mr Charles ascends by himself.

As the balloon still retained a great quantity of inflammable gas, Mr Charles determined to take another voyage by himself. Mr Robert accordingly got out of the boat, which was thus lightened by 130 pounds, and of consequence the aerostatic machine now had nearly as much power of ascent. Thus he was carried up with such velocity, that in twenty minutes he was almost 9000 feet high, and entirely out of sight of terrestrial objects. At the moment of his parting with the ground, the globe had been rather flaccid; but it soon began to swell, and the inflammable air escaped from it in great quantity through the silken tube. He also frequently drew the valve that it might be the more freely emitted, and the balloon effectually prevented from bursting. The inflammable gas being considerably warmer than the external air, diffused itself all round, and was felt like a warm atmosphere; but in ten minutes the thermometer indicated a variation of temperature as great as that between the warmth of spring and the ordinary cold of winter.

19
Has a pain in his ear and jaw when in the higher regions.

His fingers were benumbed by the cold, and he felt a violent pain in his right ear and jaw, which he ascribed to the dilatation of the air in these organs as well as to the external cold. The beauty of the prospect which he now enjoyed, however, made amends for these inconveniences. At his departure the sun was set on the valleys; but the height to which Mr Charles was got in the atmosphere, rendered him again visible, though only for a short time. He saw, for a few seconds vapours rising from the valleys and rivers. The clouds seemed to ascend from the earth, and collect one upon the other, still preserving their usual form; only their colour was grey and monotonous for want of sufficient light in the atmosphere.

20
Various currents of wind and eddies in these regions.

By the light of the moon, he perceived that the machine was turning round with him in the air; and he observed that there were contrary currents which brought him back again. He observed also, with surprise, the effects of the wind, and that the streamers of his banners pointed upwards;

21
Streamers of his banners stand upwards.

which, he says, could not be the effect either of his ascent or descent, as he was moving horizontally at the time. At last, recollecting his promise of returning to his friends in half an hour, he pulled the valve, and accelerated his descent. When within 200 feet of the earth, he threw out two or three pounds of ballast, which rendered the balloon again stationary: but, in a little time afterwards, he gently alighted in a field about three miles distant from the place whence he set out; though, by making allowance for all the turnings and windings of the voyage, he supposes that he had gone through nine miles at least. By the calculations of M. de Maunier, he rose at this time not less than 10,500 feet high; a height somewhat greater than that of Mount Ætna. A small balloon, which had been sent off before the two brothers set out on their voyage, took a direction opposite to that of the large one, having met with an opposite current of air, probably at a much greater height.

22
Attempts to guide aerostatic machines in the atmosphere.

The subsequent aerial voyages differ so little from that just now related, that any particular description of them seems to be superfluous. It had occurred to Mr Charles, however, in his last flight, that there might be a possibility of directing the machine in the atmosphere; and this was soon attempted by Mr Jean-Pierre Blanchard, a gentleman who had, for several years before, amused himself with endeavours to fly by mechanical means, though he had never succeeded in the undertaking. As soon as the discovery of the aerostatic machines was announced, however, he resolved to add the wings of his former machine to a balloon, and made no doubt that it would then be in his power to direct himself through the air at pleasure. In his first attempt he was frustrated by the impetuosity of a young gentleman, who insisted, right or wrong, on ascending along with him. In the scuffle which ensued on this occasion, the wings and other apparatus were entirely destroyed;

23
Two first voyages of Mr Blanchard.

so that Mr Blanchard was obliged to commit himself to the direction of the wind; and in another attempt it was found, that all the strength he could apply to the wings was scarce sufficient to counteract the impression of the wind in any degree. In his voyage, he found his balloon, at a certain period, acted upon by two contrary winds; but, on throwing out four pounds of ballast, he ascended to a place where he met with the same current he had at setting out from the earth.

24
His sensations while in the atmosphere.

His account of the sensations he felt during this voyage, was somewhat different from that of Mr Charles; having, in one part of it, found the atmosphere very warm, in another cold; and having once found himself very hungry, and at another time almost overcome by a propensity to sleep. The height to which he arose, as measured by several observations with mathematical instruments, was thought to be very little less than 20,000 feet; and he remained in the atmosphere an hour and a quarter.

25
Voyage of Mess. Morveau and Bertrand.

The attempts of Mr Blanchard to direct his machine through the atmosphere, were repeated in the month of April 1784 by Messrs Morveau and Bertrand, at Dijon, who raised themselves with an inflammable air balloon to the height, as it was thought, of 13,000 feet; passing through a space of 18 miles in an hour and 25 minutes. Mr Morveau had prepared a kind of oars for directing the machine through the air; but they were damaged by a gust of wind, so that only two of them remained serviceable: by working these, however, they were able to produce a sensible effect on the motion of the machine.

26
Third voyage of Mr Blanchard.

In a third aerial voyage performed by Mr Blanchard, he seemed to produce some effect by the agitation of his wings, both in ascending, descending, moving sidewise, and even in some measure against the wind; however, this is supposed, with some probability, to have been a mistake, as, in all his succeeding voyages, the effects of his machinery could not be perceived.

The

27 Second voyage of Meſſieurs Charles and Robert.

The ſucceſs of Meſſrs Charles and Robert in their former experiments, encouraged them ſoon to repeat them, with the addition of ſome machinery to direct their courſe. Having enlarged their former balloon to to the ſize of an oblong ſpheroid 46$\frac{1}{3}$ feet long and 27$\frac{1}{2}$ in diameter, they made it to float with its longeſt part parallel to the horizon. The wings were made in the ſhape of an umbrella without the handle, to the top of which a ſtick was faſtened parallel to the aperture of the umbrella. Five of theſe were diſpoſed round the boat, which was near 17 feet in length. The balloon was filled in 3 hours, and, with the addition of 450 pounds of ballaſt, remained *in æquilibrio* with the atmoſphere. About noon, on the 19th of September 1784, they began to aſcend very gently in conſequence of throwing out 24 pounds of ballaſt, but were ſoon

28 Are in danger of running into thunder-clouds.

obliged to throw out eight pounds more in order to avoid running againſt ſome trees. Thus they roſe to the height of 1400 feet, when they perceived ſome thunder-clouds near the horizon. On this they aſcended and deſcended, to avoid the danger, as the wind blew directly towards the threatening clouds; but, from the height of 600 feet to that of 4200 above the ſurface of the earth, the current was quite uniform and in one direction. During their voyage they loſt one of their oars; but, found, that by means of thoſe which remained, they conſiderably accelerated their courſe. From the account of their voyage, it would ſeem that they had paſſed ſafely through the thunder-clouds; as we are informed, that, about 40 minutes after three, they heard a loud clap of thunder; and, three minutes after, another much louder; at which time the thermometer ſunk from 77 to 59 degrees. This ſudden cold, occaſioned by the approach of the clouds, condenſed the inflammable air ſo that the balloon deſcended

29 Heat of the air within their balloon.

ed very low, and they were obliged to throw out 40 pounds of ballaſt; yet on examining the heat of the air within the balloon, they found it to be 104°, when that of the external atmoſphere was only 63. When they had got ſo high that the mercury in the barometer ſtood

30 Effect of their oars in moving the machine.

only at 23,94 inches, they found themſelves becalmed; ſo that the machine did not go even at the rate of two feet in a ſecond, though it had before gone at the rate of 24 feet in a ſecond. On this they determined to try the effect of their oars to the utmoſt; and, by working them for 35 minutes, and marking the ſhadow of the balloon on the ground, they found, in that time, that they had deſcribed the ſegment of an ellipſis whoſe longeſt diameter was 6000 feet. After having travelled about 150 miles, they deſcended, only on account of the approach of night, having ſtill 200 pounds of ballaſt left.

Their concluſion, with regard to the effect of their wings, is as follows: "Thoſe experiments ſhow, that far from going againſt the wind, as is ſaid by ſome perſons to be poſſible in a certain manner, and ſome aeronauts pretend to have actually done, we only obtained, by means of two oars, a deviation of 22 degrees: it is certain, however, that if we could have uſed our four oars, we might have deviated about 40 degrees from the direction of the wind, and as our machine would have been capable of carrying ſeven perſons, it would have been eaſy for five perſons to have gone, and to have put in action eight oars, by means of which a deviation of about 80 degrees would have been obtained.

"We had already obſerved (ſay they), that if we did not deviate more than 22 degrees, it was becauſe the wind carried us at the rate of 24 miles an hour; and it is natural to judge, that, if the wind had been twice as ſtrong as it was, we ſhould not have deviated more than one-half of what we actually did; and, on the contrary, if the wind had been only half as ſtrong, our deviation would have been proportionably greater."

31 Contrivances uſed to prevent the waſte of inflammable air.

Having thus related all that has been done with regard to the conducting of aeroſtatic machines through the atmoſphere, we ſhall now relate the attempts that have been made to leſſen their expence, by falling upon ſome contrivance to aſcend without throwing out ballaſt, and to deſcend without loſing any of the inflammable air.

32 Voyage of the Duke de Chartres

The fiſt attempt of this kind was made by the Duke de Chartres; who, on the 15th of July 1784, aſcended with the two brothers, Charles and Robert, from the Park of St Cloud. The balloon was of an oblong form, made to aſcend with its longeſt diameter horizontally, and meaſured 55 feet in length and 24 in breadth. It contained within it a ſmaller balloon filled with common air; by blowing into which with a pair of bellows, and thus throwing in a conſiderable quantity of common air, it was ſuppoſed that the machine would become ſufficiently heavy to deſcend, eſpecially as, by the inflation of the internal bag, the inflammable air in the external one would be condenſed into a ſmaller ſpace, and thus become ſpecifically heavier. The voyage, however, was attended with ſuch circumſtances as rendered it impoſſible to know what would have been the event of the ſcheme. The power of aſcent with which they ſet out, ſeems to have been very great; as, in three minutes after parting with the

33 Is involved in dark clouds and attacked by a whirlwind.

ground, they were loſt in the clouds, and involved in ſuch a denſe vapour that they could ſee neither the ſky nor the earth. In this ſituation they ſeemed to be attacked by a whirlwind, which, beſides turning the balloon three times round from right to left, ſhocked, and beat it ſo about, that they were rendered incapable of uſing any of the means propoſed for directing their courſe, and the ſilk ſtuff of which the helm had been compoſed was even torn away. No ſcene can be conceived more terrible than that in which they were now involved. An immenſe ocean of ſhapeleſs clouds rolled one upon another below them, and ſeemed to prevent any return to the earth, which ſtill continued inviſible, while the agitation of the balloon became greater every moment. In this extremity they cut the cords which held the interior balloon, and of conſequence it fell down upon the aperture of the tube that came from the large balloon into the boat, and ſtopped it up. They were then driven upwards by a guſt of wind from below, which carried them to the top of the ſtormy vapour in which they had been involved. They now ſaw the ſun without a cloud; but the heat of his rays, with the diminiſhed denſity of the atmoſphere, had ſuch an effect on the inflammable air, that the balloon ſeemed every moment ready to burſt. To prevent this they introduced a ſtick through the tube, in order to puſh away the inner balloon from its aperture; but the expanſion of the inflammable air puſhed it ſo cloſe, that all

all attempts of this kind proved ineffectual. It was now, however, become absolutely necessary to give vent to a very considerable quantity of the inflammable air; for which purpose the Duke de Chartres himself bored two holes in the balloon, which tore open for the length of seven or eight feet. On this they descended with great rapidity; and would have fallen into a lake, had they not hastily thrown out 60 pounds of ballast, which enabled them just to reach the water's edge.

The success of the scheme for raising or lowering aerostatic machines by means of bags filled with common air being thus rendered dubious, another method was thought of. This was to put a small aerostatic machine with rarefied air under an inflammable air-balloon, but at such a distance that the inflammable air of the latter might be perfectly out of the reach of the fire used for inflating the former; and thus, by increasing or diminishing the fire in the small machine, the absolute weight of the whole would be considerably diminished or augmented. This scheme was unhappily put in execution by the celebrated Mr Pilatre de Rozier, and another gentleman named Mr Romaine. Their inflammable-air balloon was about 37 feet in diameter, and the power of the rarefied-air one was equivalent to about 60 pounds. They ascended without any appearance of danger or sinister accident; but had not been long in the atmosphere when the inflammable-air balloon was seen to swell very considerably, at the same time that the aeronauts were observed, by means of telescopes, very axious to get down, and busied in pulling the valve and opening the appendages to the balloon, in order to facilitate the escape of as much inflammable air as possible. A short time after this the whole machine was on fire, when they had then attained the height of about three quarters of a mile from the ground. No explosion was heard; and the silk which composed the air-balloon continued expanded, and seemed to resist the atmosphere for about a minute; after which it collapsed, and the remains of the apparatus descended along with the two unfortunate travellers so rapidly, that both of them were killed. Mr Pilatre seemed to have been dead before he came to the ground; but Mr Romaine was alive when some persons came up to the place were he lay, though he expired immediately after.

34 Unfortunate voyage and death of Messrs Rozier and Romaine.

These are the most remarkable attempts that have been made to improve the science of aerostation; tho' a great number of other expeditions through the atmosphere have taken place. But of all the voyages which had been hitherto projected or put in execution, the most daring was that of Mr Blanchard and Dr Jeffries across the Straits of Dover which separate Britain from France. This took place on the 7th of January 1785, being a clear frosty morning, with a wind, barely perceptible, at N. N. W. The operation of filling the balloon began at 10 o'clock, and, at three quarters after twelve, every thing was ready for their departure. At one o'clock Mr Blanchard desired the boat to be pushed off, which now stood only two feet distant from that precipice so finely described by Shakespeare in his tragedy of King Lear. As the balloon was scarcely sufficient to carry two, they were obliged to throw out all their ballast except three bags of ten pounds each; when they at last rose gently, though making very little way on account of there being so little wind. At a quarter after one o'clock, the barometer, which on the cliff stood at 29.7 inches, was now fallen to 27.3, and the weather proved fine and warm. They had now a most beautiful prospect of the south coast of England, and were able to count 37 villages upon it. After passing over several vessels, they found that the balloon, at 50 minutes after one, was descending, on which they threw out a sack and an half of ballast; but as they saw that it still descended, and that with much greater velocity than before, they now threw out all the ballast. This still proving ineffectual, they next threw out a parcel of books they carried along with them, which made the balloon ascend, when they were about midway betwixt France and England. At a quarter past two, finding themselves again descending, they threw away the remainder of their books, and, ten minutes after, they had a most enchanting prospect of the French coast. Still, however, the machine descended; and as they had now no more ballast, they were fain to throw away their provisions for eating, the wings of their boat, and every other moveable they could easily spare. "We threw away, says Dr Jeffries, our only bottle, which, in its descent, cast out a steam like smoke, with a rushing noise; and when it struck the water, we heard and felt the shock very perceptibly on our car and balloon." All this proving insufficient to stop the descent of the balloon, they next threw out their anchors and cords, and at last stripped off their clothes, fastening themselves to certain strings, and intending to cut away the boat as their last resource. They had now the satisfaction, however, to find that they were rising; and as they passed over the high lands between Cape Blanc and Calais, the machine rose very fast, and carried them to a greater height than they had been at any former part of their voyage. They descended safely among some trees in the forest of Guiennes, where there was just opening enough to admit them.

35 Voyage of Mess. Blanchard and Jeffries across the Straits of Dover.

It would be tedious as well as unnecessary to recount all the other aerial voyages that have been performed in different parts of Europe: It appeared sufficient for the purpose of this article to notice those which were most remarkable and interesting; and therefore an account of the ingenious Mr Baldwin's excursion from Chester, alluded to above, shall now close our enumeration.

On the 8th of September 1785, at forty minutes past one P. M. Mr Baldwin ascended from Chester in Mr Lunardi's (A) balloon. After traversing in a variety of different directions, he first alighted, at 28 minutes after three, about 12 miles from Chester, in the neighbourhood of Frodsham; then reascending and pursuing his excursion, he finally landed at Rixton moss, five miles N. N. E. of Wavington, and 25 miles from Chester. Mr Baldwin has published his Observations and Remarks made during his voyage, and taken from minutes. Our limits will not admit of relating many

(A) Accounts of this gentleman's adventurous excursions have been published in all the Newspapers; and therefore it appeared unnecessary to take up room with an account of them in this article.

many of his observations; but the few following are some of the most important and curious. "The sensation of ascending is compared to that of a strong pressure from the bottom of the car upwards against the soles of his feet. At the distance of what appeared to him seven miles from the earth, though by the barometer scarcely a mile and a half, he had a grand and most enchanting view of the city of Chester and its adjacent places below. The river Dee appeared of a red colour; the city very diminutive; and the town entirely blue. The whole appeared a perfect plain, the highest building having no apparent height, but reduced all to the same level, and the whole terrestrial prospect appeared like a coloured map. Just after his first ascent, being in a well-watered and maritime part of the country, he observed a remarkable and regular tendency of the balloon towards the sea; but shortly after rising into another current of air, he escaped the danger: this upper current, he says, was visible to him at the time of his descent, by a lofty sound stratum of clouds flying in a safe direction. The perspective appearance of things to him was very remarkable. The lowest bed of vapour that first appeared as cloud was pure white, in detached fleeces, increasing as they rose: they presently coalesced, and formed, as he expresses it, a sea of cotton, tufting here and there by the action of the air in the undisturbed part of the clouds. The whole became an extended white floor of cloud, the upper surface being smooth and even. Above this white floor he observed, at great and unequal distances, a vast assemblage of thunder-clouds, each parcel consisting of whole acres in the densest form: he compares their form and appearance to the smoke of pieces of ordnance, which had consolidated as it were into masses of snow, and penetrated thro' the upper surface or white floor of common clouds, there remaining visible and at rest. Some clouds had motions in slow and various directions, forming an appearance truly stupendous and majestic. He endeavours to convey some idea of the scene by a figure; (and from which fig. 13. of Plate III. is copied). *A* represents a circular view he had from the car of the balloon, himself being over the centre of the view, looking down on the white floor of clouds and seeing the city of Chester through an opening, which discovered the landscape below, limited by surrounding vapour, to less than two miles in diameter. The breadth of the outer margin defines his apparent height in the balloon (viz. 4 miles) above the white floor of clouds. Mr Baldwin also gives a curious description of his tracing the shadow of the balloon over tops of volumes of clouds. At first it was small, in size and shape like an egg; but soon encreased to the magnitude of the sun's disc, still growing larger, and attended with a most captivating appearance of an iris encircling the whole shadow at some distance round it, the colours of which were remarkably brilliant. The regions did not feel colder, but rather warmer, than below. The sun was hottest to him when the balloon was stationary. The discharge of a cannon when the balloon was at a considerable height, was distinctly heard by the aeronaut; and a discharge from the same piece, when at the height of 30 yards, so disturbed him as to oblige him for safety to lay hold firmly of the cords of the balloon. At a considerable height he poured down a pint bottle full of water; and as the air did not oppose a resistance sufficient to break the stream into small drops, it mostly fell down in large drops. In the course of the balloon's tract it was found much affected by the water (a circumstance observed in former aerial voyages). At one time the direction of the balloon kept continually over the water, going directly towards the sea, so much as to endanger the aeronaut; the mouth of the balloon was opened, and he in two minutes descended into an under current blowing from the sea: he kept descending, and landed at Bellair farm in Rinsley, 12 miles from Chester. Here he lightened his car by 31 pounds, and instantly reascending was carried into the interior part of the country, performing a number of different manoeuvres. At his greatest altitude he found his respiration free and easy. Several bladders which he had along with him crackled and expanded very considerably. Clouds and land, as before, appeared on the same level. By way of experiment, he tried the upper valve two or three times, the neck of the balloon being close; and remarked, that the escape of the gas was attended with a growling noise like millstones, but not near so loud. Again, round the shadow of the balloon, on the clouds, he observed the iris. A variety of other circumstances and appearances he met with, is fancifully described; and at 53 minutes past three he finally landed.

The frequency of aerial voyages, accompanied with particular details of trifling and uninteresting circumstances, and apparently made with a view to promote the interest of particular persons, regardless of any advancement in knowledge, have now sunk the science of aerostation so low in the opinion of most people, that that before giving any account of the most proper method of constructing these machines, it may seem necessary to premise something concerning the uses to which they may possibly be applied. These according to Mr Cavallo are the following.

36 Uses of aerostation.

"The small balloons, especially those made of paper, and raised by means of spirit of wine, may serve to explore the direction of the winds in the upper regions of the atmosphere, particularly when there is a calm below: they may serve for signals in various circumstances, in which no other means can be used; and letters or other small things may be easily sent by them, as for instance from ships that cannot safely land on account of storms, from besieged places, islands, or the like. The larger aerostatic machines may answer all the abovementioned purposes in a better manner; and they may, besides, be used as a help to a person who wants to ascend a mountain, a precipice, or to cross a river; and perhaps one of these machines tied to a boat by a long rope, may be in some cases, a better sort of sail than any that is used at present. The largest sort of machines, which can take up one or more men, may evidently be subservient to various œconomical and philosophical purposes. Their conveying people from place to place with great swiftness, and without trouble, may be of essential use, even if the art of guiding them in a direction different from that of the wind should never be discovered. By means of those machines the shape of certain seas and lands may be better ascertained; men may ascend to the tops of mountains they never visited before; they may be carried over marshy, and

and dangerous grounds; they may by that means come out of a besieged place, or an island; and they may, in hot climates, ascend to a cold region of the atmosphere, either to refresh themselves, or to observe the ice which is never seen below; and, in short, they may be thus taken to several places, to which human art hitherto knew of no conveyance.

"The philosophical uses, to which these machines may be subservient, are numerous indeed; and it may be sufficient to say, that hardly any thing which passes in the atmosphere is known with precision, and that principally for want of a method of ascending into it. The formation of rain, of thunder-storms, of vapours, hail, snow, and meteors in general, require to be attentively examined and ascertained. The action of the barometer, the rarefaction and temperature of the air in various regions, the descent of bodies, the propagation of sound, &c. are subjects which all require a series of observations and experiments, the performance of which could never have been properly expected before the discovery of aerostatic machines."

To those uses we may add the gratification of curiosity and pleasure as a very strong inducement to the practice of an art, in which, with any tolerable degree of caution, there appears not to be the smallest danger. Every one who has tried the experiment testifies, that the beauty of the prospect afforded by an ascent, or the pleasure of being conveyed through the atmosphere, cannot be exceeded. No one has felt the least of that giddiness consequent upon looking from the top of a very high building or of a precipice, nor have they any of the sickness arising from the motion of a vessel at sea. Many have been carried by balloons at the rate of 30, 40, or even 50 miles an hour, without feeling the least inconvenience, or even agitation of the wind; the reason of which is, that as the machine moves with nearly the velocity of the wind itself, they are always in a calm, and without uneasiness. Some have apprehended danger from the electricity of the atmosphere; and have thought that a stroke of lightning, or the smallest electric spark, happening near a balloon, might set fire to the inflammable air, and destroy both the machine and the adventurers. Mr Cavallo has suggested several considerations for diminishing apprehensions of this kind. Balloons have been already raised in every season of the year, and even when thunder has been heard, without injury. In case of danger, the aeronauts may either descend to the earth, or ascend above the region of the clouds and thunder-storms. Besides, as balloons are formed of materials that are not conductors of electricity, they are not likely to receive strokes, especially as by being encompassed with air they stand insulated. Moreover, inflammable air by itself, or unmixed with a certain quantity of common air, will not burn; so that if an electric spark should happen to pass through the balloon, it would not set fire to the inflammable air, unless a hole was made in the covering.

37 Principles of aerostation.

The general principles of aerostation are so little different from those of hydrostatics, that it may seem superfluous to insist much upon them. It is a fact universally known, That when a body is immersed in any fluid, if its weight be less than an equal bulk of that fluid, it will rise to the surface; but if heavier, it will sink; and if equal, it will remain in the place where it is left. For this reason smoke ascends into the atmosphere, and heated air in that which is colder. The ascent of the latter is shown in a very easy and satisfactory manner by bringing a red-hot iron under one of the scales of a balance, by which the latter is instantly made to ascend; for, as soon as the red-hot iron is brought under the scale, the hot air being lighter than that which is colder, ascends, and strikes the bottom, which is thus impelled upwards, and the opposite scale descends, as if a weight had been put into it.

38 Experiments showing the impulse of heated air.

Upon this simple principle depends the whole theory of aerostation; for it is the same thing whether we render the air lighter by introducing a quantity of heat into it, or inclosing a quantity of gas specifically lighter than the common atmosphere in a certain space; both will ascend, and for the same reason. A cubic foot of air, by the most accurate experiments, has been found to weigh about 554 grains, and to be expanded by every degree of heat, marked on Fahrenheit's thermometer, about $\frac{1}{500}$th part of the whole. By heating a quantity of air, therefore, to 500 degrees of Fahrenheit, we will just double its bulk when the thermometer stands at 54 in the open air, and in the same proportion we will diminish its weight; and if such a quantity of this hot air be inclosed in a bag, that the excess of the weight of an equal bulk of common air weighs more than the bag with the air contained in it, both the bag and air will rise into the atmosphere, and continue to do so until they arrive at a place where the external air is naturally so much rarefied that the weight becomes equal; and here the whole will float.

The power of hot air in raising weights, or rather that by which it is itself impelled upwards, may be shown in the following manner: Roll up a sheet of paper into a conical form, and, by thrusting a pin into it near the apex, prevent it from unrolling. Fasten it then, by its apex, under one of the scales of a balance by means of a thread, and, having properly counterpoised it by weights, put it into the opposite scale; apply the flame of a candle underneath, you will instantly perceive the cone to arise, and it will not be brought into equilibrium with the other but by a much greater weight than those who have never seen the experiment would believe. If we try this experiment with more accuracy, by getting proper receptacles made which contain determinate quantities of air, we will find that the power of the heat depends much more on the capacity of the bag which contains it than could be well supposed. Thus, let a cubical receptacle be made of a small wooden frame covered with paper capable of containing one foot of air, and let the power of a candle be tried with this as above directed for the paper cone. It will then be found that a certain weight may be raised; but a much greater one will be raised by having a receptacle of the same kind which contains two cubic feet; a still greater by one of three feet; a yet greater by one of four feet, &c. and this even though the very same candle be made use of; nor is it known to what extent even the power of this small flame might be carried.

39 Rarefied-air balloons ought to be made as large as possible.

From these experiments it appears, that in the aerostatic machines constructed on Montgolfier's plan, it must be an advantage to have them as large as possible; because

because a smaller quantity of fire will then have a greater effect in raising them, and the danger from that element, which in this kind of machines is chiefly to be dreaded, will be in a great measure avoided. On this subject it may be remarked, that as the cubical contents of a globe, or any other figure of which balloons are made, increase much more rapidly than their surfaces, there must ultimately be a degree of magnitude at which the smallest imaginable heat would raise any weight whatever. Thus, supposing any aerostatic machine capable of containing 500 cubic feet, and the air within it to be only one degree hotter than the external atmosphere; the tendency of this machine to rise, even without the application of artificial heat, would be near an ounce. Let its capacity be increased 16 times; and the tendency to arise will be equivalent to a pound, though this may be done without making the machine 16 times heavier than before. It is certain, however, that all aerostatic machines have a tendency to produce or preserve heat within them, which would by no means be imagined by those who have not made the experiment. When Messrs Charles and Roberts made their longest aerial voyage of 150 miles, they had the curiosity to try the temperature of the air within their balloon, in comparison with that of the external atmosphere; and at this time they found, that when the external atmosphere was 63°, the thermometer, within the balloon stood at 104°. Such a difference of temperature must have given a machine of the magnitude which carried them a considerable ascending power independent of any other cause, as it amounted to 41 grains on every cubic foot; and therefore in a machine containing 50,000 such feet would have been almost 200 pounds. Hence we may easily account for what happened at Dijon, and is recorded by Mr Morveau. "A balloon, intended to be filled with inflammable air, being completed, was, by way of trial, filled with the common air, and in that state exposed to the atmosphere. Now it was observed, and indeed a similar observation had been made before, that the air within the balloon was much hotter than the circumambient air: the thermometer in the former stood at 120°; whereas in the latter, even when the sun shone upon it, the thermometer stood at 84°. This showed a considerable degree of rarefaction within the balloon; and consequently it was suspected, that by means of this rarefaction alone, especially if it were to increase a little, the balloon might ascend. On the 30th of May, about noon, the wind being rather strong, agitated the balloon so that two men were employed to take care of it; but notwithstanding all their endeavours, it escaped from its confinement, and, lifting up about 65 pounds weight of cords, equatorial circle, &c. rose many feet high, and, passing over some houses, went to the distance of 250 yards, where at length it was properly secured."

40 How balloons might rise by the common heat of the atmosphere

41 A balloon at Dijon rises thus into the atmosphere.

41 Internal heat of the balloons has great influence on aerial voyages.

This difference between the external and internal heat being so very considerable, must have a great influence upon aerostatic machines, and will undoubtedly influence those filled with inflammable air as well as the other kind. Nor is it unlikely, that the short time which many aerial voyagers have been able to continue in the amosphere, may have been owing to the want of a method of preserving this internal heat. It may naturally be supposed, and indeed it has always been found, that balloons, in passing through the higher regions of the atmosphere, acquire a very considerable quantity of moisture, not only from the rain or snow they sometimes meet with, but even from the dew and vapour which condenses upon them. On this an evaporation will instantly take place; and as it is the property of this operation to produce a very violent cold, the internal heat of the balloon must be soon exhausted in such a manner as to make it become specifically heavier than the common atmosphere, and consequently descend in a much shorter time than it would have done by the mere loss of air. To this, in all probability, we are to ascribe the descent of the balloon which carried Messrs Blanchard and Jeffries; and which seemed so extraordinary to many people, that they were obliged to have recourse to an imaginary attraction in the waters of the ocean in order to solve the phenomenon. This supposition is rejected by Mr Cavallo; who explains the matter, by remarking, that in two former voyages made with the same machine, it could not long support two men in the atmosphere; so that we had no occasion to wonder at its weakness on this occasion. "As for its rising higher (says he) just when it got over the land, that may be easily accounted for. In the first place, the two travellers threw out their clothes just about that time; secondly, in consequence of the wind's then increasing, the balloon travelled at a much greater rate than it had done whilst over the sea; which increase of velocity lessened its tendency to descend: besides which, the vicissitudes of heat and cold may produce a very considerable effect; for if we suppose, that the air over the land was colder than that over the sea, the balloon coming into the latter from the former, continued to be hotter than the circumambient air for some time after; and consequently, it was comparatively much lighter when in the cold air over the land, than when in the hotter air over the sea; hence it floated easier in the former than in the latter case."

43 Great tendency of Mr Blanchard's balloon to descend accounted for.

It seems indeed very probable, that there was something uncommon in the case of Mr Blanchard's balloon while passing over the sea; for, as it rose higher after reaching the land than in any former period of the voyage, and likewise carried them to the distance over land more than half of that which they had passed over water, we can scarce avoid supposing, that it had a tendency to descend when over the water more than when over land, independent of any loss of air. Now, it does not appear that the air over the sea is at all warmer than that above land; on the contrary, there is every reason to believe, that the superior reflective power of the land renders the atmosphere above it warmer than the sea can do; but it is very natural to suppose, that the air above the sea is more moist than that above land; and consequently by letting fall its moisture upon the balloon, must have occasioned an evaporation that would deprive the machine of its internal heat, which it would partly recover after it entered the warmer and drier atmosphere over land.

We shall now proceed to the construction of aerostatic machines; of which the smaller are only for amusement, or some slight experiments, and are very easily made. As in all of them, however, it is of the utmost consequence to have the weight as little as possible, the shape becomes an object of great consideration.

Construction of aerostatic machines.

45 Of their shape. tion. For this purpose a spherical figure has been mathematically demonstrated to be the best; as capable of containing a greater quantity under a smaller surface than any other. Thus a perfect sphere contains less surface in proportion to its solidity than a spheroid; a spheroid less than a cylinder; the latter less than a cube; and a cube still less than a parallelopiped. In all cases, therefore, where we can fill the whole capacity of the balloon with air equally light, the spherical figure is undoubtedly to be preferred; and this holds good with regard to all inflammable air-balloons, whether their size be great or small; but in the rarefied air ones, where the under part must necessarily be much colder than the upper, the globular shape seems not so proper. An inverted cone, or truncated pyramid, with the smaller part undermost, seems then to be most proper, as it allows the heated air (which has a great tendency to expand as well as to ascend) to collect in the wide part at the top, while the useless surface in the lower part, and which, in any other figure, would contain only the colder and heavier air, is thus thrown aside. In fact it has been found, that aerostatic machines, raised by means of rarefied air, when made of the shape of a parallelopiped, or even one deviating still more from the shape of a globe, have answered the purpose as well as they could have been supposed to do, had ever so much care been taken in forming them exactly to that shape. The very first machine made by Mr Montgolfier was in form of a parallelopiped; and though it contained only 40 cubic feet, showed a very considerable power of ascent. A very large one, 74 feet high, which Mr Montgolfier had designed to exhibit before the royal family, had the middle part of it prismatic for about the height of 25 feet; its top was a pyramid of 29 feet: and its lower part was a truncated cone of near 20 feet. It weighed 1000 pounds; and, notwithstanding its shape, in a very short time manifested a power of ascent equal to 500 pounds. Another aerostatic machine of a smaller size, but of the figure of a parallelopiped, being suffered to ascend with 30 sheets of oiled paper fixed to a wire frame, and set on fire, rose to a great height, and in 22 minutes could not be seen. It seems therefore, that, with regard to the shape of these machines, it is by no means necessary to adhere rigidly to that of a sphere; but that any oblong form answers very well.

46 Materials. For experimental purposes, both the inflammable and rarefied air-balloons may be made of paper; the former being made of that kind called *thin-post*, varnished over with linseed-oil; the latter either of that or any other kind, without varnish. In order to avoid the danger of burning, however, it has been proposed to impregnate the paper of which these small rarefied air-balloons are made with solution of sal-ammoniac, alum, or some other salt; but this does not seem to be necessary. Those filled with inflammable air have been made of gold-beater skin or peeled bladders; but the cheaper material of paper is undoubtedly preferable.

74 Best varnish for inflammable-air balloons, according to Mr de St Fond. For aerostatic machines of a larger size, the material universally employed is varnished silk; and for those of the rarefied-air kind, linen painted over with some size colour, or lined with paper. The best varnish for an inflammable air-balloon is that made with bird-lime, and recommended by Mr Faujas de Saint-Fond, in a treatise published on the subject. The following is his method of preparing it: "Take one pound of birdlime, put it into a new proper earthen pot that can resist the fire, and let it boil gently for about one hour, viz. till it ceases to crackle; or, which is the same thing, till it is so far boiled, as that a drop of it being let fall upon the fire will burn: then pour upon it a pound of spirits of turpentine, stirring it at the same time with a wooden spatula, and keeping the pot at a good distance from the flame, least the vapour of this essential oil should take fire. After this, let it boil for about six minutes longer; then pour upon the whole three pounds of boiling oil of nuts, linseed, or poppy rendered drying by means of litharge; stir it well, let it boil for a quarter of an hour longer, and the varnish is made. After it has rested for 24 hours, and the sediment has gone to the bottom, decant it into another pot; and when you want to use it, warm, and apply it with a flat brush upon the silk stuff, whilst that is kept well stretched. One coat of it may be sufficient; but if two are necessary, it will be proper to give one on each side of the silk, and to let them dry in the open air while the silk remains extended."

48 Mr Cavallo's method. Mr Cavallo gives the following method of preparing this varnish, which he prefers to that of M. d St Fond.—"In order to render linseed-oil drying, boil it with two ounces of saccharum saturni and three ounces of litharge, for every pint of oil, till the oil has dissolved them, which will be accomplished in half an hour; then put a pound of birdlime and half a pint of the drying oil into a pot (iron or copper pots are the safest for this purpose), the capacity of which may be equal to about one gallon, and let it boil very gently over a slow charcoal fire till the birdlime ceases to crackle, which will be in about half or three quarters of an hour; then pour upon it two pints and a half more of drying oil, and let it boil for one hour longer, stirring it very frequently with an iron or wooden spatula. As the varnish, whilst boiling, and especially when it is nearly done, swells very much, care should be had to remove, in those cases, the pot from the fire, and to replace it when the varnish subsides, otherwise it will boil over. Whilst the stuff is boiling, the operator should, from time to time, examine whether the varnish has boiled enough; which is thus known:—Take some of it upon the blade of a knife, and then, after rubbing the blade of another knife upon it, separate the knives; and when on this separation, the varnish begins to form threads between the two, you may conclude that it is done; and, without loosing time, it must be removed from the fire. When it is almost, though not quite, cold, add about an equal quantity of spirit of turpentine: mix it well together, and let it rest till the next day; when, having warmed it a little, strain and bottle it. It it is too thick, add some more spirit of turpentine. When this varnish is laid upon the silk, the stuff should be made perfectly dry, and stretched; so that the varnish, which ought to be used lukewarm, may fill up the pores of the stuff. The varnish should be laid once very thin upon one side of the stuff; and about 12 hours after, two other coats of it should be laid on, one on each side; and, 24 hours after, the silk may be used, though in cold weather, it may be left to dry some time longer."

Much has been said in France of their elastic gum-

varnish,

varniſh, and its compoſition kept a ſecret; but Mr Baldwin, after many expenſive trials, declares to the world what he conſiders as the ſecret; and it is merely this: "Take any quantity of caoutchouc, as two ounces averdupois; cut it into ſmall bits with a pair of ſciſſars; put a ſtrong iron ladle (like that uſed by plumbers) over a common pitcoal or other fire. The fire muſt be gentle, glowing, and without ſmoke. When the ladle is hot, much below a red heat, put a ſingle bit into the ladle. If *black* ſmoke iſſues, it will preſently flame and diſappear, or it will evaporate without flame: the ladle is then too hot. When the ladle is leſs hot, put in a ſecond bit, which will produce a *white* ſmoke. This *white* ſmoke will continue during the operation, and evaporate the caouthouc: therefore no time is to be loſt; but little bits are to be put in, a few at a time, till the whole are melted. It ſhould be continually and gently ſtirred with an iron or braſs ſpoon. Two pounds or one quart of the beſt drying oil (or of raw linſeed-oil, which, together with a few drops of neats-foot oil, has ſtood a month, or not ſo long, on a lump of quicklime, to make it more or leſs drying), is to be put into the melted caoutchouc, and ſtirred till hot, and the whole poured into a glazed veſſel, through a coarſe guaze or fine ſieve. When ſettled and clear, which will be in a few minutes, it will be fit for uſe either hot or cold." Mr Baldwin is not at liberty, he obſerves, to publiſh the art of laying on the varniſh: but ſays, that it conſiſts in making no *inteſtine motion* in the varniſh, which would create minute bubbles; that therefore bruſhes are improper. Mr Blanchard's method of making elaſtic-gum varniſh for the ſilk of a balloon, is the following. "Diſſolve elaſtic gum (caoutchouc) cut ſmall in five times its weight of ſpirit of turpentine, by keeping them ſome days together; then boil one ounce of this ſolution in eight ounces of drying linſeed-oil for a few minutes; laſtly, ſtrain it. It muſt be uſed warm." The pieces of ſilk for the balloon muſt be cut out of a proper ſize, according to the dimenſions, after the varniſh is ſufficiently dry. They may be joined by laying about half an inch of the edge of one piece over the edge of the other, and ſewing them by a double ſtitching. Mr Blanchard uſes expeditiouſly the following method. He lays about half an inch of the edge of one piece flat over the edge of the other, and paſſes a hot iron over it; in doing which a piece of paper ought to be laid both under and over the ſilk. The joining may be rendered more ſecure by running it with a ſilk thread, and ſticking a ribband over it. The ribbands laid over ſeams may be ſtuck with common glue, provided the varniſh of the ſilk is properly dried. When the glue is quite dry, the ribbands ſhould be varniſhed over, to prevent their being unglued by the rain.

49
Of cutting the gores for a globe.

The beſt method of cutting the pieces of ſilk that are to form a balloon, is to deſcribe a pattern of wood or ſtiff card-paper, and then to cut the ſilk upon it. As the edges of ſuch a pattern are not perfect circles, they cannot be deſcribed by a pair of compaſſes; but the beſt method of drawing them is as follows. First, draw, on a flat ſurface two right lines AE and BC, perpendicular to each other. Secondly, find the circumference anſwering to the given diameter of the balloon in feet and decimals of a foot; and make AD and DE each equal to a quarter of the circumference, ſo that the whole length AE of the pattern may be equal to half the circumference. Thirdly, divided AD into 18 equal parts; and to the points of diviſion apply the lines *fg*, *hi*, *kl*, &c. parallel to each other, and perpendicular to AD. Fourthly, divide the whole circumference in twice the given number of pieces, and make DC and BB each equal to the quotient of this diviſion; ſo that the whole, BC, is equal to the greateſt breadth of one of theſe pieces. Fifthly, multiply the abovementioned quotient by the decimals annexed to *fg*, viz. 0.99619, and then the product expreſſes the length of *fg*; again multiply the ſame length of DE by the decimals annexed to *hi*, and the product expreſſes the length of *hi*; and, in ſhort, the product ariſing from the multiplication of the length of DC by the decimals annexed to each of the parallel lines, gives the length of that line. Laſtly, having found the lengths of all theſe lines, draw by hand a curve-line paſſing through all the extremities of the ſaid lines, and that is the edge of one quarter of the pattern. The other quarters may be eaſily deſcribed, by applying to them a piece of paper cut according to that already found.—Suppoſe, for example, that the diameter of the balloon to be conſtructed is 20 feet, and that it is required to make it of 12 pieces: then, in order to draw the pattern for thoſe pieces, find the circumference of the balloon, which is 62.83 feet, and, dividing it by four, the quotient is 15.7 feet; make therefore AD equal to 15.7 feet, and DE likewiſe of the ſame length. Divide the circumference 62.83 by 24, which is double the number of pieces that are to form the balloon, and the quotient, 2.618 feet, is the length of DC and likewiſe of BD; ſo that BC is equal to 5.236 feet. Then, having divided the line AD into 18 equal parts, and having drawn the parallel lines from thoſe points of diviſion, find the length of each of thoſe lines by multiplying 2.618 by the decimals annexed to that line. Thus, 2.618, multiplied by 0.99619, gives 2.608 feet for the length of *fg*; and again, multiplying 2.618 by 0.98481, gives 2.578 feet for the length of *hi*; and ſo of the reſt.—In cutting the pieces after ſuch a pattern, care ſhould be taken to leave them about three quarters of an inch all round larger than the pattern, which will be taken up by the ſeams.

Plate III. fig. 5.

To the upper part of the balloon there ſhould be adapted, and well fitted in, a valve opening inwards; to which ſhould be faſtened a ſtring paſſing through a hole made in a ſmall piece of round wood fixed in the lower part of the balloon oppoſite to the valve, the end of this ſtring faſtened to the car below, ſo that the aeronaut may open the valve when occaſion requires. The action of this valve may be underſtood from fig. 6. A round braſs plate AB has a round hole CD, about two or three inches diameter, covered on both ſides with ſtrong ſmooth leather. On the inſide there is a ſhutter E, alſo of braſs, covered with leather, which is to cloſe the hole CD; being about two inches larger in diameter than the hole. It is faſtened to the leather of the plate AB; and by a ſpring, which need not be very ſtrong, it is kept againſt the hole. The elaſticity of the gas itſelf will help to keep it ſhut. To this ſhutter the ſtring is faſtened, by which it is occaſionally opened for the eſcape of gas. A ſmall ſtring

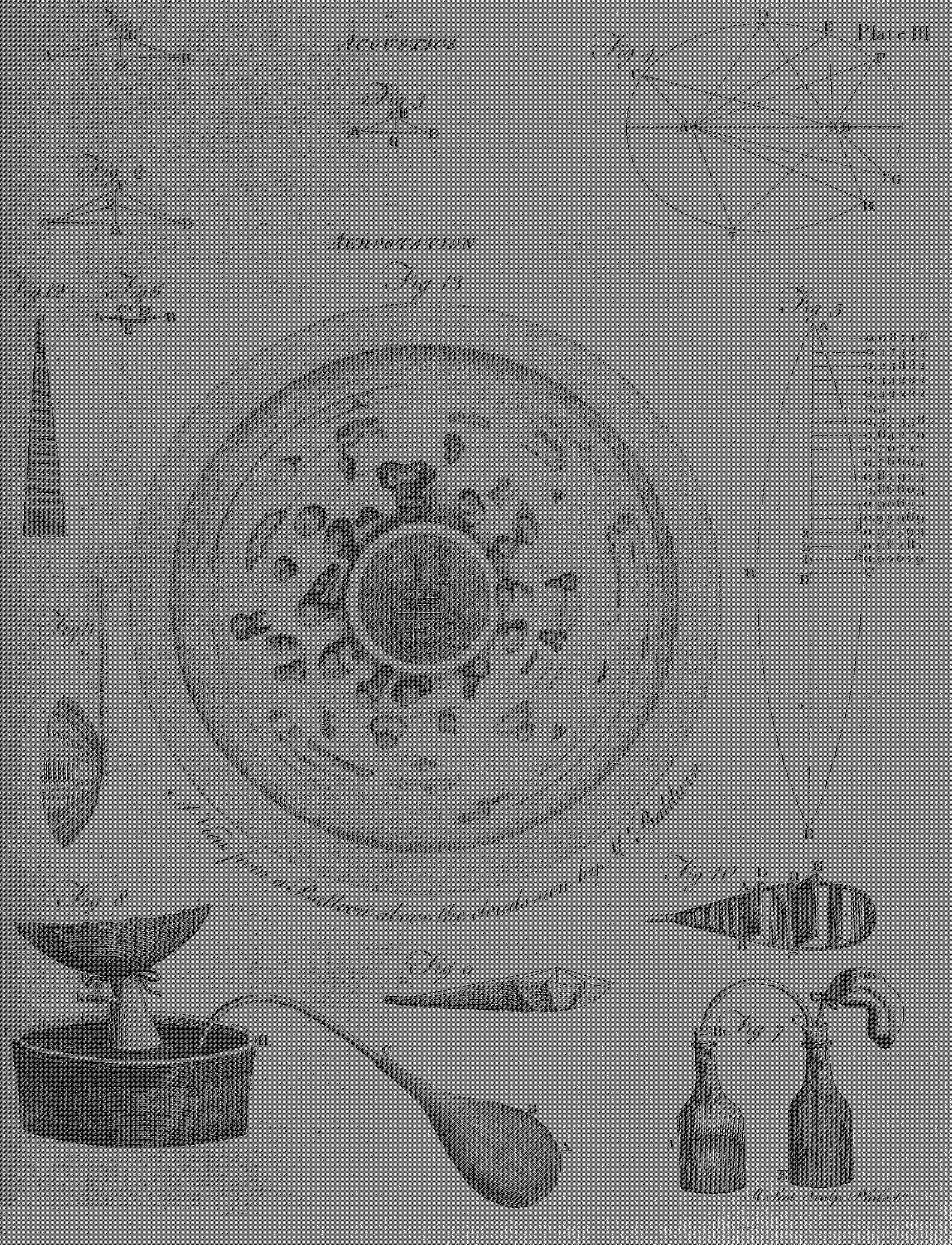


Plate III
Acoustics
Fig 1
Fig 2
Fig 3
Fig 4
Aerostation
Fig 5
0,08716
0,17365
0,25882
0,34202
0,42262
0,5
0,57358
0,64279
0,70711
0,76604
0,81915
0,86603
0,90631
0,93969
0,96593
0,98481
0,99619
Fig 6
Fig 7
Fig 8
Fig 9
Fig 10
Fig 12
Fig 13
Fig 14
A View from a Balloon above the clouds seen by Mr Baldwin
R. Scot Sculp. Philada

string or other security should be fixed to the shutter and the plate, so as not to admit the shutter to be opened beyond a certain safe distance. To the lower part of the balloon two pipes should be fixed, made of the same stuff as the envelope; 6 inches diameter for a balloon of 30 feet, and proportionally larger for balloons of a greater capacity. They must be long enough for the car. For balloons of 18 feet and less diameter, one neck or pipe will be sufficient. These pipes are the apertures through which the inflammable gas is introduced into the balloon.

The car or boat is best made of wicker-work, covered with leather, and well painted or varnished over; and the proper method of suspending it, is by ropes proceeding from the net which goes over the balloon. This net should be formed to the shape of the balloon, and fall down to the middle of it, with various cords proceeding from it to the circumference of a circle about two feet below the balloon; and from that circle other ropes should go to the edge of the boat. This circle may be made of wood, or of several pieces of slender cane bound together. The meshes of the net may be small at top, against which part of the balloon the inflammable air exerts the greatest force; and increase in size as they recede from the top. A hoop has sometimes been applied round the middle of the balloon to fasten the net. This, though not absolutely necessary, is best made of pieces of cane bound together, and covered with leather.

With regard to the rarefied-air machines, Mr Cavallo recommends first to soak the cloth in a solution of sal ammoniac and common size, using one pound of each to every gallon of water; and when the cloth is quite dry, to paint it over in the inside with some earthy colour, and strong size or glue. When this paint has dried perfectly, it will then be proper to varnish it with oily varnish, which might dry before it could penetrate quite through the cloth. Simple drying linseed oil will answer the purpose as well as any, provided it be not very fluid.

50 Of filling aerostatic machines.

It now only remains to give some account of the method by which aerostatic machines may be filled with their proper gas, in order to give them their power of ascending into the atmosphere; and here we are enabled to determine with much greater precision concerning the inflammable-air balloons than the others. With regard to them, a primary consideration is, the most proper method of procuring the inflammable air. It may be obtained in various ways, as has been shown under the article AEROLOGY: But the most advantageous methods are, by applying acids to certain metals; by exposing animal, vegetable, and some mineral substances, in a close vessel to a strong fire; or by transmitting the vapour of certain fluids through red-hot tubes.

51 Methods of procuring inflammable air.

1. In the first of these methods, iron, zinc, and vitriolic acid, are the materials most generally used. The vitriolic acid must be diluted by five or six parts of water. Iron may be expected to yield in the common way 1700 times its own bulk of gas; or one cubic foot of inflammable air to be produced by $4\frac{1}{2}$ ounces of iron, the like weight of oil of vitriol, and $22\frac{1}{2}$ ounces of water. Six ounces of zinc, an equal weight of oil of vitriol, and 30 ounces of water, are necessary for producing the same quantity of gas. It is more proper to use the turnings or chippings of great pieces of iron, as of cannon, &c. than the filings of that metal, because the heat attending the effervescence will be diminished; and the diluted acid will pass more readily through the interstices of the turnings when they are heaped together, than through the filings, which stick closer to one another. The weight of the inflammable air thus obtained by means of acid of vitriol, is, in the common way of procuring it, generally one seventh part of the weight of common air; but with the necessary precautions for philosophical experiments, less than one-tenth of the weight of common air. Two other sorts of elastic fluids are sometimes generated with the inflammable air. These may be separated from it by passing the inflammable air through water in which quicklime has been dissolved. The water will absorb these fluids, cool the inflammable air, and prevent its over-heating the balloon when introduced into it.

Fig. 7. of Plate III. represents an apparatus described by Mr Cavallo as proper for filling balloons of the size of two or three feet in diameter with inflammable air, after passing it through water.—A is the bottle with the ingredients; BCD a tube fastened in the neck at B, and passing through C, the cork of the other bottle, in which there is another hole made to receive the tube on which the balloon is tied. Thus it is plain, that the inflammable air coming out of the tube D will pass first through the water of the bottle E and then into the balloon. Two small casks may be used instead of the bottles A and E.

2. Inflammable air may be obtained at a much cheaper rate by the action of fire on various substances; but the gas which these yield is not so light as that produced by the effervescence of acids and metals. The substances proper to be used in this way are, pit-coal, asphaltum, amber, rock-oil, and other minerals: wood and especially oak, camphor-oil, spirits of wine, ether, and animal substances, which yield air in different degrees, and of various specific gravities; but pit-coal is the preferable substance. A pound of this exposed to a red heat, yields about three cubic feet of inflammable air, which, whether it be passed through water or not, weighs about one-fourth of the weight of common air. Dr Priestley found, as we have elsewhere noticed, that animal or vegetable substances will yield six or seven times more inflammable air when the fire is suddenly increased than when it is gently raised, though it be afterwards made very strong. Mr Cavallo observes, that the various substances above enumerated generally yield all their inflammable air in about one hour's time. The general method is, to inclose the substances in iron or earthen vessels, and thus expose them to a strong fire sufficient to make the vessels red-hot: the inflammable air proceeding from the aperture of the vessel is received into a tube or refrigeratory, and, passing through the tube or worm, is at last collected in a balloon or other vessel. A gun barrel has often been used for essays of this kind. The substance is put into it so as to fill six or eight inches of its lowest part, the remainder filled with dry sand: a tube, adapted to the mouth of the barrel, is brought into a bason of water under an inverted receiver; and the part of the barrel containing the substance being put into the fire and made red-hot, the inflammable air is collected

lected in the inverted receiver. As the gun-barrel cannot serve for producing a large quantity of inflammable air, Mr Cavallo recommends, as the most advantageous shape, the following contrivance:—Let the vessel be made of clay, or rather of iron, in the shape of a Florence flask, somewhat larger, and whose neck is longer and larger (See ABC, fig. 8.) Put the substance to be used into this vessel, so as to fill about four-fifths or less of its cavity AB. If the substance is of such a nature as to swell much by the action of the fire, lute a tube of brass, or first a brass and then a leaden tube, to the neck C of the vessel; and let the end D of the tube be shaped as in the figure, so that going into the water of a tub HI, it may terminate under a sort of inverted vessel EF, to the upper aperture of which the balloon G is adapted. Things thus prepared, if the part AB of the vessel is put into the fire, and made red-hot, the inflammable air produced will come out of the tube CD, and passing through the water will at last enter into the balloon G. Previous to the operation, as a considerable quantity of common air remains in the inverted vessel EF, which it is more proper to expel, the vessel EF should have a stop-cock K, through which the common air may be sucked out, and the water ascend as high as the stop-cock. The dimensions of such an apparatus Mr Cavallo gives thus: Diameter of largest part of the vessel ABC seven inches, length of whole vessel 16 inches; diameter of its aperture one inch, diameter of the cavity of tube CD three-fourths of an inch; lower aperture of the vessel EF six inches, least height of the vessel EF 24 inches; its aperture F about two inches. The aperture of the vessel EF should be at least one foot below the surface of the water in HI. Care must be taken that the fire used in this process be at a sufficient distance, otherwise it may happen to fire the inflammable air which may escape out of the vessel EF.

3. The last method of obtaining inflammable air was lately discovered by Mr Lavoisier, and also by Dr Priestley. Mr Lavoisier made the steam of boiling water pass through the barrel of a gun, kept red-hot by burning coals. Dr Priestley uses, instead of the gun-barrel, a tube of red-hot brass, upon which the steam of water has no effect, and which he fills with the pieces of iron which are separated in the boring of cannon. By this method he obtains an inflammable air, the specific gravity of which is to that of common air as 1 to 13. In this method, not yet indeed reduced to general practice, a tube, about three quarters of an inch in diameter, and about three feet long, is filled with iron turnings; then the neck of a retort, or close boiler, is luted to one of its ends, and the worm of a refrigeratory is adapted to its other extremity. The middle part of the tube is then surrounded with burning coals, so as to keep about one foot in length of it red-hot, and a fire is always made under the retort or boiler sufficient to make the water boil with vehemence.—In this process a considerable quantity of inflammable air comes out of the worm of the refrigeratory. It is said that iron yields one half more air by this means, than by the action of vitriolic acid.

For filling large balloons, a greater apparatus is necessary; and the only materials that can, with any certainty of success, be employed for producing the proper gas, are, oil of vitriol, and iron filings or turnings.

It has indeed been recommended to use zinc instead of iron filings, because white vitriol, the salt produced by the union of the vitriolic acid and zinc, is much more valuable than the green sort produced by the union of the same acid with iron. But though this is undoubtedly the case, it will as certainly be found, upon trial, that the superior price of the zinc will be more than an equivalent for all the advantage that can be derived from the additional price of the white vitriol. 52 Mr Cavallo's receipt. For a balloon of 30 feet diameter, Mr Cavallo recommends 3900 pounds of iron turnings, as much oil of vitriol, and 19,500 pounds of water. These proportions, however, appear too great with respect to the acid and metal, and too little with respect to the water. Oil of vitriol will not exert its power upon iron unless it be diluted with five or six times its quantity of water; in which case, a much smaller quantity of both acid and metal will serve. 53 Mr Lunardi's method. Mr Lunardi, who from the number of his voyages had certainly much practical knowledge in aerostation, filled his balloon at Edinburgh and Glasgow with about 2000 pounds of iron (the borings of cannon procured from Carron), as much vitriolic acid, and 12,000 pounds of water. The iron was placed in his vessels in layers, with straw between them, in order to increase the surface. His apparatus was not materially different from that of Mr Cavallo, represented bottom of Plate I. fig. 2. where AA are two tubs, about three feet in diameter and nearly two feet deep, inverted in large tubs BB filled with water. In the bottom of each of the inverted tubs a hole is made, and a tube E of tin adapted, which is about seven inches in diameter, and seven or eight long. To these tubes the silken ones of the balloon are to be tied. Round each of the tubs B, five, six, or more strong casks are placed; in the top of each two holes are made, and to one of these holes a tin tube is adapted, and so shaped, that, passing over the edge of the tub B, and through the water, it may terminate with its aperture under the inverted tub A. The other hole of these casks serves for the introduction of materials, and is stopped with a wooden plug. When the balloon is to be filled, put the net over it, and let it be suspended as shown by CDF; and having expelled all the common air from it, let the silken tubes be fastened round the tin ones EE; and the materials being put into the casks, the inflammable air, passing into the balloon, will soon distend, and render it capable of supporting itself; after which the rope GH may be slipped off. As the balloon continues to be filled, the net is adjusted properly round it; the cords that surround it are fastened to the hoop MN; then the boat IK being placed between the two sets of casks, is fastened to the hoop MN, and every thing that is required to be sent up, as ballast, instruments, &c. is placed in it. At last, when the balloon is little more than three quarters full, the silken tubes are separated from the tin ones of the inverted tubs, and their extremities being tied up, are placed in the boat. Lastly, the aeronauts being seated in the boat, the lateral ropes are slipped off, and the machine is abandoned to the air. (See *Blanchard's balloon*, Plate II.) This apparatus was at last reduced by Mr Lunardi to its utmost simplicity, by using only two large casks, and suffering the vapour to go into the balloon without passing through water. Thus his balloon was filled in in less than half an hour, when, before, it had required two hours at least. The sinking of his casks in the ground was also an additional convenience, as it created no confusion, and rendered the materials much more easily conveyed into them.

54 Of filling rarefied-air balloons.

With regard to the rarefied-air balloons, the method of filling them is as follows. A scaffold ABCD, the breadth of which is at least two-thirds of the diameter of the machine, is elevated about six or eight feet above the ground. From the middle of it descends a well E, rising about two or three feet above it, and reaching to the ground, furnished with a door or two, through which the fire in the well is supplied with fuel. The well should be constructed of brick or of plastered wood, and its diameter should be somewhat less than that of the machine. On each side of the scaffold are erected two masts HI, KL, each of which has a pulley at the top, and rendered firm by means of ropes KG, KP, IIP, HG. The machine to be filled is to be placed on the scaffold, with the neck round the aperture of the well. The rope passing over the pullies of the two masts, serves, by pulling its two ends, to lift the balloon about 15 feet or more above the scaffold; and the rest of the machine is represented by the dotted lines in the figure MNO. The machine is kept steady, and held down, whilst filling, by ropes passing through loops or holes about its equator; and these ropes may easily be disengaged from the machine, by slipping them through the loops when it is able to sustain itself. The proper combustibles to be lighted in the well, are those which burn quick and clear, rather than such as produce much smoke; because it is hot air, and not smoke, that is required to be introduced into the machine. Small wood and straw have been found to be very fit for this purpose. Mr Cavallo observes, as the result of many experiments with small machines, that spirits of wine are upon the whole the best combustible; but its price may prevent its being used for large machines. As the current of hot air ascends, the machine will soon dilate, and lift itself above the scaffold and gallery which was covered by it. The pessengers, fuel, instruments, &c. are then placed in the gallery. When the machine makes efforts to ascend, its aperture must be brought, by means of the ropes annexed to it, towards the side of the well a little above the scaffold; the fire-place is then suspended in it, the fire lighted in the grate, and the lateral ropes being slipped off the machine is abandoned to the air. (See *Mongolfier's balloon*, Plate II.) It has been determined by accurate experiments, that only one-third of the common air can be expelled from these large machines; and therefore the ascending power of the rarefied air in them can be estimated as only equal to half an ounce averdupoise for every cubic foot.

The conduct of balloons, when constructed, filled, and actually ascending in the atmosphere, is an object of great importance in the practice of aerostation. The method generally used for elevating or lowering the balloons with rarefied air, has been the increase or diminution of the fire; and this is entirely at the command of the aeronaut, as long as he has any fuel in the gallery. The inflammable-air balloons have been gerally raised or lowered by diminishing the weight in the boat, or by letting out some of the gas through the valve: but the alternate escape of the air in descending, and discharge of the ballast for ascending, will by degrees render the machine incapbable of floating; for in the air it is impossible to supply the loss of ballast, and very difficult to supply that of inflammable air. These balloons will also rise or fall by means of the rarefaction or condensation of the inclosed air, occasioned by heat and cold. It has been proposed to aid a balloon in its alternate motion of ascent and descent, by annexing to it a vessel of common air, which might be condensed for lowering the machine, and rarefied again, by expelling part of it, for raising the machine: But a vessel adapted to this purpose must be very strong; and, after all, the assistance afforded by it would not be very considerable. M. Meunier, in order to attain this end, proposes to inclose one balloon filled with common air in another filled with inflammable air: as the balloon ascends, the inflammable air is dilated, and of course compresses the internal balloon containing the common air; and by diminishing its quantity, lessens its weight. If it should be necessary to supply this loss, he says it may be easily done by a pair of bellows fixed in the gallery. Others have proposed to annex a small machine with rarefied air to an inflammable-air balloon by ropes, at such a distance that the fire of the former might not affect the inflammable air of the latter: the whole apparatus, thus combined, of balloons formed on the two principles of heated and inflammable air, might be raised or lowered by merely increasing or diminishing the fire in the lower balloon.

Wings or oars are the only means of this sort that have been used with some success; and as Mr Cavallo observes, they seem to be capable of considerable improvement. Although great effects are not to be expected from them when the machine goes at a great rate, the best methods of moving those wings are by the human strength applied similarly to the oars of a waterman. They may be made in general of silk stretched between wires, tubes, or sticks; and when used must be turned edgewise when they are moved in the direction in which the machine is intended to be impelled, but flat in the opposite direction. Fig. 9. Plate III. is the representation of one of Mr Blanchard's wings. Fig. 10. is one of those used by Mr Lunardi, which consists of many silk shutters or valves, ABCD, DECF, &c. every one of which opens on one side only, viz. ADBC opens upon the line AB, DECF opens upon the line DC, &c. In consequence of this construction, this sort of oars do not need being turned edgewise. Fig. 11. represents one of the wings used by the brothers Roberts in the aerial voyage of the 19th September 1784; and fig. 12. represents one of the wings constructed by Count Zambeccari, which consists of a piece of silk stretched between two tin tubes set at an angle; but these wings are so contrived as to turn edgewise by themselves when they go on one direction. Other contrivances have been made to direct aerostatic machines, but they have mostly been invented to effect a power upon them as upon a ship. It appears, however, that they can have no effect when a machine is only moved by the wind alone, because the circumambient air is at rest in respect to the machine. The case is quite different with a vessel at sea, because the water on which it floats stands whilst the vessel goes on; but it must be time and experience that can realize the expectations suggested by these contrivances.

AERSHOT, a town in the Netherlands, in the duchy of Brabant, and capital of the duchy of Aershot. It is seated on the river Demur, ten miles east of Malines or Mechlin, and eight north of Louvain. E. Long. 5. 4. N. Lat. 51. 15.

ÆRUGINOUS, an epithet given to such things as resemble or partake of the nature of the rust of copper.

ÆRUGO, in natural history, properly signifies the rust of copper, whether natural or artificial. The former is found about copper mines, and the latter, called *verdegris*, made by corroding copper-plates with acids. See *Verdegris*.

ÆRUSCATORES, in antiquity, a kind of strolling beggars, not unlike gypsies, who drew money from the credulous by fortune-telling, &c. It was also a denomination given to griping exactors, or collectors of the revenue. The Galli, or priests of Cybele, were called *æruscatores magnæ matris*; and μητραγυρται, on account of their begging or collecting alms in the streets; to which end they had little bells whereby to draw people's attention to them, much like some orders of mendicants in some parts of Europe.

AERY, or AIRY, among sportsmen. See AIRY.

ÆS UXORIUM, in antiquity, a sum paid by bachelors, as a penalty for living single to old age. This tax for not marrying seems to have been first imposed in the year of Rome 350, under the censorship of M. Furius Camillus and M. Posthumus. At the census, or review of the people, each person was asked, *Et tu ex animi sententia uxorem habes liberum quærendorum causa?* He who had no wife was hereupon fined after a certain rate, called *æs uxorium*.

Æs per et libram was a formula in the Roman law, whereby purchases and sales are ratified. Originally the phrase seems to have been only used in speaking of things sold by weight, or by the scales; but it afterwards was used on other occasions. Hence even in adoptions, as there was a kind of imaginary purchase; the formula whereof expressed, that the person adopted was bought *per æs et libram*.

Æs Flavum, yellow copper, among the Romans, an appellation given to the coarser kinds of brass.

Æs Caldarium, a term used by the German mineralists, for a substance which sometimes occurs to those who work upon cobalt, and is used for the making the fine blue colour called *smalt*.

Æs Ustum, a chemical preparation, made of thin leaves of copper, sulphur, and nitre, placed *stratum super stratum* in a crucible, and set in a charcoal fire till all the sulphur is consumed; after which, the copper is taken out of the crucible, and reduced to power. Some quench the leaves of copper in vinegar, and repeat the calcination.—Its principal use is in colouring glass, to which it gives a beautiful tincture. The surgeons use it as a detersive, and some have given it internally; but it is certainly a very dangerous medicine, and should be avoided.

ÆSCHINES, a Socratic philosopher, the son of Charinus a sausage-maker. He was continually with Socrates; which occasioned this philosopher to say, that the sausage-maker's son was the only person who knew how to pay a due regard to him. It is said that poverty obliged him to go to Sicily to Dionysius the Tyrant; and that he met with great contempt from Plato, but was extremely well received by Aristippus; to whom he showed some of his dialogues, and received from him a handsome reward. He would not venture to profess philosophy at Athens, Plato and Aristippus being in such high esteem; but he set up a school to maintain himself. He afterwards wrote orations for the Forum. Phrynicus, in Photius, ranks him among the best orators, and mentions his orations as the standard of the pure Attic style. Hermogenes has also spoken very highly of him.—He also wrote several dialogues, of which there are only three extant: 1. concerning Virtue, whether it can be taught. 2. Eryxias, or Erasistratus; concerning riches, whether they are good. 3. Axiochus; concerning death, whether it is to be feared. Mr Le Clerc has given a Latin translation of them, with notes, and several dissertations intitled *Sylvæ Philologicæ*.

ÆSCHYLUS, the tragic poet, was born at Athens. Authors differ in regard to the time of his birth, some placing it in the 65th, others in the 70th Olympiad; but according to Stanley, who relies on the Arundelian marbles, he was born in the 63d Olympiad. He was the son of Euphorion, and brother to Cynegirus and Aminias, who distinguished themselves in the battle of Marathon, and the sea-fight of Salamis, at which engagements Æschylus was likewise present. In this last action, according to Diodorus Siculus, Aminias, the younger of the three brothers, commanded a squadron of ships, and behaved with so much conduct and bravery, that he sunk the admiral of the Persian fleet, and signalized himself above all the Athenians. To this brother our poet was, upon a particular occasion, obliged for saving his life: Ælian relates, that Æschylus being charged by the Athenians with certain blasphemous expressions in some of his pieces, was accused of impiety, and condemned to be stoned to death: they were just going to put the sentence in execution, when Aminias, with a happy presence of mind, throwing aside his cloak, showed his arm without a hand, which he had lost at the battle of Salamis in defence of his country. This sight made such an impression on the judges, that, touched with the remembrance of his valour, and with the friendship he showed for his brother, they pardoned Æschylus. Our poet, however, resented the indignity of this persecution, and resolved to leave a place where his life had been in danger. He became more determined in his resolution when he found his pieces less pleasing to the Athenians than those of Sophocles, tho' a much younger writer. Some affirm, that Æschylus never sat down to compose but when he had drank liberally. He wrote a great number of tragedies, of which there are but seven remaining: and notwithstanding the sharp censures of some critics, he must be allowed to have been the father of the tragic art. In the time of Thespis, there was no public theatre to act upon; the strollers driving about from place to place in a cart. Æschylus furnished his actors with masks, and dressed them suitably to their characters. He likewise introduced the buskin, to make them appear more like heroes.—The ancients gave Æschylus also the praise of having been the first who removed murders and shocking sights from the eyes of the spectators. He is said likewise to have lessened the number of the chorus. M. Le Fevre has observed, that Æschylus never represented women in love in his tragedies; which, he says, was not suited to his genius; but, in representing a woman transported with fury, he was incomparable. Longinus says, that

Æschylus has a noble boldness of expression; and that his imagination is lofty and heroic. It must be owned, however, that he affected pompous words, and that his sense is too often obscured by figures: this gave Salmasius occasion to say, that he was more difficult to be understood than the scripture itself. But notwithstanding these imperfections, this poet was held in great veneration by the Athenians, who made a public decree that his tragedies should be played after his death. He was killed in the 69th year of his age, by an eagle letting fall a tortoise upon his head as he was walking in the fields. He had the honour of a pompous funeral from the Sicilians, who buried him near the river Gela; and the tragedians of the country performed plays and theatrical exercises at his tomb.—The best edition of his plays is that of London, 1663, fol. with a Latin translation, and a learned commentary by Thomas Stanley.

ÆSCHYNOMENE, Bastard sensitive-plant: A genus of the decandria order, belonging to the diadelphia class of plants; the characters of which are: The *calyx* is a one-leav'd campanulated bilabiated perianthium; the lips equal, but the superior one two-cleft, the inferior tridentate. The *corolla* is papillionaceous; the banner cordated and subringent; the *alæ* ovate, obtuse, and shorter than the banner; and the carina lunated, pointed, and the length of the alæ. The *stamina* consist of 10 simple 9-cleft filaments; the antheræ small. The *pistillum* is an oblong villous columnar germen; the stylus subulated and ascending, the stigma simple and somewhat obtuse. The pericarpium is a long compressed, unilocular jointed pod. The *seeds* are kidney-shaped, and solitary within each joint. Of this genus there are reckoned six.

Species. 1. The aspera (as well as the rest of this genus) is a native of warm countries. It rises to the height of four or five feet, having a single herbaceous stalk, which is rough in some parts. The leaves come out on every side towards the top, forming a sort of head; the flowers come out between the leaves, two or three together upon long footstalks; they are yellow, and shaped like those of peas: after the flower is past, the germen becomes a flat jointed pod, which, when ripe, parts at the joints, and in each division is lodged a single kidney-shaped seed. 2. The American, seldom rises more than two feet in height. The flowers come out from the leaves on branching footstalks, five or six together; these are much less than the former, and of a paler yellow colour. The seed is lodged in pods like the other. 3. The arborea, grows to the height of six or seven feet, with a single stem; the flowers come out two or three together, of a copper colour, and as large as those of the aspera. 4. The sesban hath woody stems, and branches garnished with smooth leaves. The flowers are small, of a deep yellow colour, and come out on long spikes hanging downward. The seed is contained in a smooth pod not jointed. 5. The pumila, rises to the height of about three feet, has flowers of a pale yellow colour, which comes out sometimes single, at other times two or three upon each footstalk. The seeds are contained in a long falcated pod having 13 or 14 divisions, each of which lodges a single seed. 6. The grandiflora, rises six or eight feet high, with a woody stem, sending out branches towards the top, garnished with obtuse leaves. The flowers are large, yellow, and succeeded by large pods containing kidney-shaped seeds.

Culture. These plants are propagated by seeds, which should be sown early in the spring, on a hot-bed; and when the plants have strength enough to be removed, they should each be put into a separate pot filled with light earth, and plunged into a hot-bed. As they increase in size, they must be removed into larger pots; but if these are too large, the plants will not thrive. They must be brought forward early in the year, otherwise the second kind will not perfect its seed.

ÆSCULAPIUS, in the Heathen mythology, the god of physic, was the son of Apollo and the nymph Coronis. He was educated by the Centaur Chiron, who taught him physic; by which means Æsculapius cured the most desperate diseases. But Jupiter, enraged at his restoring to life Hippolitus, who had been torn in pieces by his own horses, killed him with a thunderbolt. According to Cicero, there were three deities of this name: the first, the son of Apollo, worshipped in Arcadia, who invented the probe, and bandages for wounds; the second, the brother of Mercury, killed by lightning; and the third, the son Arisippus and Arsinoe, who first taught the art of tooth-drawing and purging. At Epidaurus, Æsculapius's statue was of gold and ivory, with a long beard, his head surrounded with rays, holding in one hand a knotty stick, and the other entwined with a serpent; he was seated on a throne of the same materials as his statue, and had a dog lying at his feet. The Romans crowned him with laurel, to represent his descent from Apollo; and the Phaliasins represented him as beardless. The cock, the raven, and the goat, were sacred to this deity. His chief temples were at Pergamus, Smyrna, Trica a city in Ionia, and the isle of Coos; in all which, votive tablets were hung up, showing the diseases cured by his assistance. But his most famous shrine was at Epidaurus; where, every five years, games were instituted to him, nine days after the Isthmian games at Corinth.

ÆSCULUS, the Horse-chesnut: A genus of the monogynia order, belonging to the heptandria class of plants; and ranking, in the natural method, under the 39th order, *Trihilatæ*.—The characters are: The *calyx* is a small single-leaved, bellied perianthium, divided into five segments. The *corolla* (except in the *pavia*, where it is four petal'd and close) consists of five roundish, flat expanding petals, unequally coloured, and with narrow claws inserted into the calyx. The *stamina* have seven subulated declining filaments, the length of the corolla; the antheræ ascending. The *pistillum* is a roundish germen, ending in a subulated stylus; the stigma pointed. The *pericarpium* is a leathery, roundish, trilocular, three-valved capsule. The *seeds* are two, and subglobular. In this genus Van Rozen and Miller observe both male and hermaphrodite flowers. There are two

Species. 1. The hippocastanum, or common horse-chesnut. It was brought from the northern parts of Asia about the year 1550, and sent to Vienna about 1588. This tree makes a noble appearance all the month of May, the extremities of the branches being terminated by fine spikes of flowers spotted with rose colours, so that the whole tree seems covered with them. It is quick in its growth; so that in a few years it arrives at a size large enough to afford a good shade in summer, Æsculus. summer, as also to produce plenty of flowers. They have, however, this great inconvenience, that their wood is of no use, being unfit even for burning: and their leaves beginning to fall in July, soon deprive the trees of their beauty. There is something very singular in the growth of these trees; which is, that the whole shoot is performed in less than three weeks after the buds are opened.—The nuts are reckoned good food for horses. In Turkey, they are ground, and mixed with the provender for these animals, especially those which are troubled with coughs, and broken winded. Deer are also very fond of the fruit; and at the time of their ripening keep much about the trees, but especially in strong winds, when the nuts are blown down, which they carefully watch, and greedily devour as they fall.

2. The pavia, or scarlet-flowering horse-chesnut, a native of Carolina, the Brazils, and the East. It grows to about fifteen or sixteen feet high: and there is a delicacy in this tree that makes it desirable. The bark of the young shoots is quite smooth, and the growing shoots in summer are of a reddish hue. The leaves are palmated, being pretty much like those of the horse-chesnut, only much smaller, and the indentures at the edges are deeper and much more acute. The lobes of which they are composed are spear-shaped; they are five in number, are united at their base, and stand on a long red footstalk. The leaves grow opposite by pairs on the branches, which are spread abroad on every side. The flowers come out from the ends of the branches. The first appearance of the buds is in May; though they will not be in full blow till the middle of June. They are of a bright red colour, and consequently have a pleasing effect among the vast tribe of yellow-flowering sorts which show themselves in bloom at that season. They continue in succession for upwards of six weeks, and sometimes succeeded by ripe seeds in our gardens.

Propagation and culture. The first species is propagated from the nuts. In autumn, therefore, when they fall, a sufficient quantity should be gathered. These should be sown soon afterwards in drills, about two inches asunder. If the nuts are kept till spring, many of them will be faulty; but where the seminary-ground cannot be got ready before, and they are kept so long, it may be proper to put them in water, to try their goodness. The good nuts will sink, whilst those which are faulty will swim; so that by proving them this way you may be sure of good nuts, and have more promising hopes of a crop. In the spring the plants will come up; and when they have stood one year, they may be taken up, their top-roots shortened, and afterwards planted in the nursery. When they are of sufficient size to be planted out finally, they must be taken out of the nursery with care, the great side-shoots and the bruised parts of the roots should be taken off, and then planted in large holes level with the surface of the ground, at the top of their roots; the fibres being all spread and lapped in the fine mold, and the turf also worked to the bottom. A stake should be placed to keep them safe from the winds; and they must be fenced from the cattle till they are of a sufficient size to defend themselves. The best season for all this work is October. After the trees are planted, neither knife nor hatchet should come near them; but they should be left to Nature to form their beautiful parabolic heads, and assume their utmost beauty.—The horse-chesnut, like most other trees, delights most in good fat land; but it will grow exceedingly well on clayey and marley grounds. Æsculus.

Miller says, "When these trees are transplanted, their roots should be preserved as entire as possible, for they do not succeed well when torn or cut: nor should any of the branches be shortened, for there is scarce any tree that will not bear amputation better than this; so that when any branches are by accident broken, they should be cut off close by the stem, that the wound may heal over."

The second species is propagated, 1. By budding it upon the young plants of the horse-chesnut. These stocks should be raised as was directed in that article. They should be planted in the nursery way, one foot asunder, and two feet distant in the rows, which should be kept clean of weeds, and must be dug between every winter till the operation is to be performed. After they have stood in the nursery-ground about two years, and have made at least one good summer's shoot, the summer following is the time for the operation. Then, having your cuttings ready soon after midsummer, the evenings and cloudy weather should be made choice of for the work. Whoever has a great number of trees to inoculate, must regard no weather, but keep working on, to get his business over before the season ends; and, indeed, a good hand will be always pretty sure of success be the weather what it will. If the stocks were healthy, the summer following they will make pretty good shoots; and in a year or two after that will flower. This is one method of propagating this tree; and those plants that are propagated this way will grow to a larger size than those raised immediately from seeds.—2. This tree also may be propagated by seeds; which will sometimes ripen with us, and may be obtained out of our gardens. The manner of raising them this way is as follows: Let a warm border be prepared; and if it is not naturally sandy, left drift-sand be mixed with the soil; and in this border let the seeds be sown in the month of March, about half an inch deep. After this, constant weeding must be observed; and when the plants are come up, if they could be shaded in the heat of the day, it would be much better. These, with now and then a gentle watering in a dry season, will be all the precautions they will require the first summer. The winter following, if the situation is not extremely well sheltered, protection must be given them from the hard black frosts, which will otherwise often destroy them; so that it will be the safest way to have the bed hooped, to cover them with mats in such weather, if the situation is not well defended: if it is, this trouble may be saved; for, even when young, they are tolerably hardy. In about two or three years they may be removed into the nursery, or planted where they are to remain, and they will flower in three or four years after. The usual nursery-care must be taken of them when planted in that way; and the best time for planting them there, or where they are to remain, is October; though they will grow exceeding well if removed in any of the winter months; but if planted late in the spring, they will require more watering, as the ground will not be so regularly

settled

Æsop. settled to the roots as if they had been planted earlier.

ÆSOP, the Phrygian, lived in the time of Solon, about the 50th Olympiad, under the reign of Crœsus the last king of Lydia. As to genius and abilities, he was greatly indebted to nature; but in other respects not so fortunate, being born a slave and extremely deformed. St Jerom, speaking of him, says he was unfortunate in his birth, condition in life, and death; hinting thereby at his deformity, servile state, and tragical end. His great genius, however, enabled him to support his misfortunes; and in order to alleviate the hardships of servitude, he composed those entertaining and instructive fables which have acquired him so much reputation. He is generally supposed to have been the inventor of that kind of writing; but this is contested by several, particularly Quintilian, who seems to think that Hesiod was the first author of fables. Æsop, however, certainly improved this art to a very great degree; and hence it is that he has been accounted the author of this sort of productions:

Æsopus auctor quam materiam reperit,
Hanc ego pollivi versibus senariis.
Phæd. Prol. ad. lib. i.

"If any thoughts in these iambics shine,
Th' invention's Æsop's, and the verse is mine."

The first master whom Æsop served, was one Carasius Demarchus, an inhabitant of Athens; and there in all probability he acquired his purity in the Greek tongue. After him he had several masters; and at length came under a philosopher named Idmon or Iadmon who enfranchised him. After he had recovered his liberty, he soon acquired a great reputation amongst the Greeks; so that, according to Meziriac, the report of his wisdom having reached Crœsus, he sent to inquire after him, and engaged him in his service. He travelled through Greece, according to the same author: whether for his own pleasure, or upon the affairs of Crœsus, is uncertain; and passing by Athens soon after Pisistratus had usurped the sovereign power, and finding that the Athenians bore the yoke very impatiently, he told them the fable of the frogs who petitioned Jupiter for a king. The images made use of by Æsop are certainly very happy inventions to instruct mankind; they possess all that is necessary to perfect a precept, having a mixture of the useful with the agreeable. "Æsop the fabulist (says Aulus Gellius) was deservedly esteemed wise, since he did not, after the manner of the philosophers, rigidly and imperiously dictate such things as were proper to be advised and persuaded; but, framing entertaining and agreeable apologues, he thereby charms and captivates the human mind."—Æsop was put to death at Delphi. Plutarch tells us that he came there with a great quantity of gold and silver, being ordered by Crœsus to offer a sacrifice to Apollo, and to give a considerable sum to each inhabitant: but a quarrel arising betwixt him and the Delphians, he sent back the money to Crœsus; for he thought those for whom the prince designed it, had rendered themselves unworthy of it. The inhabitants of Delphi contrived an accusation of sacrilege against him; and pretending they had convicted him, threw him headlong from a rock. For this cruelty and injustice, we are told they were visited with famine and pestilence; and consulting the oracle, they received for answer, that the god designed this as a punishment for their treatment of Æsop: they endeavoured to make an atonement, by raising a pyramid to his honour.

Æsop ‖ Æthalia.

ÆSOP (Clodius), a celebrated actor, who flourished about th 670th year of Rome. He and Roscius were cotemporaries, and the best performers who ever appeared upon the Roman stage, the former excelling in tragedy, the latter in comedy. Cicero put himself under their direction to perfect his action. Æsop lived in a most expensve manner, and at one entertainment is said to have had a dish which cost above eight hundred pounds; this dish, we are told, was filled with singing and speaking birds, some of which cost near 50*l*. The delight which Æsop took in these sort of birds proceeded, as Mr Bayle observes, from the expence. He did not make a dish of them because they could speak, according to the refinement of Pliny upon this circumstance, this motive being only by accident; but because of their extraordinary price. If their had been any birds that could not speak, and yet more scarce and dear than these, he would have procured such for his table. Æsop's son was no less luxurious than the father, for he dissolved pearls for his guests to swallow. Some speak of this as a common practice of his; but others mention his falling into this excess only on a particular day, when he was treating his friends. Horace* speaks only of one pearl of great value, which he dissolved in vinegar, and drank. Æsop, notwithstanding his expences, is said to have died worth above 160,000*l*. When he was upon the stage, he entered into his part to such a degree, as sometimes to be seized with a perfect ecstasy: Plutarch mentions it as reported of him, that whilst he was representing Atreus deliberating how he should revenge himself on Thyestes, he was so transported beyond himself in the heat of action, that with his truncheon he smote one of the servant crossing the stage, and laid him dead on the spot.

* Sat. ii. lib. ii. 239.

ÆSTIMATIO CAPITIS, a term met with in old law-books for a fine anciently ordained to be paid for offences committed against persons of quality, according to their several degrees.

ÆSTIVAL, in a general sense, denotes something connected with, or belonging to, summer. Hence æstival sign, æstival solstice, &c.

ÆSTUARIA, in geography, denotes an arm of the sea, which runs a good way within land. Such is the Chesapeak-bay, &c.

ÆSTUARIES, in ancient baths, were secret passages from the hypocaustum into the chambers.

ÆSTUARY, among physicians, a vapour-bath, or any other instrument for conveying heat to the body.

ÆSYMNIUM, in antiquity, a monument erected to the memory of the heroes, by Æsymnus the Megarean. He consulting the oracle in what manner the Megareans might be most happily governed, was answered, *If they held consulation with the more numerous:* whom he taking for the dead, built the said monument, and a senate-house that took within its compass the monument; imagining, that thus the dead would assist in their consulations. (Pausanias.)

ÆETH, or ATH, a strong little town in the Austrian Netherlands and province of Hainault, situated on the river Dender, about twenty miles S. W. of Brussels.

ÆTHALIA, or ILUA (anc. geog.) now *Elba*; an island

island on the coast of Etruria, in compass an hundred miles, abounding in iron, as Elba still does. Stephanus calls it *Æthale*. The port of Æthalia was called *Argous*, (Diod. Sicul.)

ÆTHELSTAN, See ATHELSTAN.

ÆTHER, is usually understood of a thin, subtile matter, or medium, much finer and rarer than air; which commencing from the limits of our atmosphere possesses the whole heavenly space.—The word is Greek, αιθηρ, supposed to be formed from the verb αιθειν, "to burn, to flame;" some of the ancients, particularly Anaxagoras, supposing it of the nature of fire. See FIRE.

The philosophers cannot conceive that the largest part of the creation should be perfectly void; and therefore they fill it with a species of matter under the denomination of *æther*. But they vary extremely as to the nature and character of this æther. Some conceive it as a body *sui generis*, appointed only to fill up the vacuities between the heavenly bodies; and therefore confined to the regions above our atmosphere. Others suppose it of so subtile and penetrating a nature, as to pervade the air, and other bodies, and possesses the pores and intervals thereof. Others deny the existence of any such specific matter; and think the air itself, by that immense tenuity and expansion it is found capable of, may diffuse itself through the interstellar spaces, and be the only matter found therein.

In effect, æther, being no object of our sense, but the mere work of imagination, brought only upon the stage for the sake of hypothesis, or to solve some phenomenon, real or imaginary; authors take the liberty to modify it how they please. Some suppose it of an elementary nature, like other bodies; and only distinguished by its tenuity, and the other affections consequent thereon: which is the philosophical æther. Others will have it of another species, and not elementary; but rather a sort of fifth element, of a purer, more refined, and spirituous nature, than the substances about our earth: and void of the common affections thereof, as gravity, &c. The heavenly species being the supposed region or residence of a more exalted class of beings, the medium must be more exalted in proportion. Such is the ancient and popular idea of æther, or ætherial matter.

The term *æther* being thus embarrassed with a variety of ideas and arbitrarily applied to so many different things, the later and severer philosophers choose to set it aside, and in lieu thereof substitute other more determinate ones. Thus, the Cartesians use the term *materia subtilis*; which is their æther: and Sir Isaac Newton, sometimes a *subtile spirit*, as in the close of his *Principia*; and sometimes a *subtile* or *ætherial medium*, as in his *Optics*.

The truth is, there are abundance of considerations, which seem to evince the existence of some matter in the air, much finer than the air itself. There is an unknown something, which remains behind when the air is taken away; as appears from certain effects which we see produced *in vacuo*. Heat, Sir Isaac Newton observes, communicated through a vacuum almost as readily as through air: but such communication cannot be without some interjacent body, to act as a medium. And such body may be subtile enough to penetrate the pores of glass; and may be very well concluded to permeate those of all other bodies, and consequently be diffused through all the parts of space which answers to the full character of an æther. See HEAT.

The existence of such an ætherial medium being settled, that author proceeds to its properties; inferring it to be not only rarer and more fluid than air, but exceedingly more elastic and active: in virtue of which properties, he shows, that a great part of the phenomena of nature may be produced by it. To the weight, *e. g.* of this medium, he attributes gravitation, or the weight of all other bodies; and to its elasticity, the elastic force of the air and of nervous fibres, and the emission, refraction, reflection, and other phenomena of light; as also, sensation, muscular motion, &c. In fine, this same matter seems the *primum mobile*, the first source or spring of physical action in the modern system.

The Cartesian æther is supposed not only to pervade, but adequately to fill, all the vacuities of bodies; and thus to make an absolute plenum in the universe.

But Sir Isaac Newton overturns this opinion, from divers considerations; by showing, that the celestial spaces are void of all sensible resistance: for, hence it follows, that the matter contained therein must be immensely rare, in regard the resistance of bodies is chiefly as their density; so that if the heavens were thus adequately filled with a medium or matter, how subtile soever, they would resist the motion of the planets and comets much more than quicksilver or gold.

The late discoveries in electricity have thrown great light upon this subject, and rendered it extremely probable that the æther so often talked of is no other than the electric fluid, or solar light, which diffuses itself throughout the whole system of nature. See ELECTRICITY, FIRE, HEAT, LIGHT, &c.

ÆTHER, in chemistry, the lightest, most volatile, and most inflammable of all liquids, is produced by distillation of acids with rectified spirit of wine. See CHEMISTRY and PHARMACY (the *Indexes*).

ÆTHERIAL, ETHERIUS, something that belongs to, or partakes of, the nature of ÆTHER. Thus we say, the *ætherial space*, *ætherial regions*, &c.

Some of the ancients divided the universe, with respect to the matter contained therein, into elementary and ætherial.

Under the ætherial world was included all that space above the uppermost element, viz. fire. This they supposed to be perfectly homogeneous, incorruptible, unchangeable, &c. See CORRUPTION. The Chaldees placed an ætherial world between the empyreum and the region of the fixed stars. Beside which, they sometimes also speak of a second ætherial world, meaning by it the starry orb; and a third ætherial world, by which is meant the planetary region.

ÆTHIOPIA. See ETHIOPIA.

ÆTHIOPS, *Mineral*, *Martial*, and *Antimonial*. See PHARMACY (*Index*).

ÆTHUSA, in botany, a genus of the pentandria digynia class; and, in the natural method, ranking under the 45th order, *Umbellatæ*. The characters are: The *calyx* is an universal umbel expanding, the interior rays shorter by degrees; with a partial umbel, small, and expanding. There is no universal involucrum; the partial one is dimidiated, with three or five leaflets, and pendulous; the proper perianthium ſcarcely diſcernible. The univerſal *corolla* is uniform, with fertile florets; the partial one has five heart-inflected unequal petals. The *ſtamina* conſiſt of five ſimple filaments, with roundiſh antheræ. The *piſtillum* is a germen beneath; with two reflected ſtyli; the ſtigmata obtuſe. There is no *pericarpium*; the fruit is ovate, ſtriated, and tripartite. The *ſeeds* are two, roundiſh and ſtriated. There is but one ſpecies, viz. the æthuſa ſynapium, fools-parſley, or leſſer hemlock (a native of Britain), which grows in corn-fields and gardens. This plant, from its reſemblance to common parſley, hath ſometimes been miſtaken for it; and when eaten, it occaſions ſickneſs. If the curled-leaved parſley only was cultivated in our gardens, no ſuch miſtakes would happen in future. Cows, horſes, ſheep, goats, and ſwine, eat it. It is noxious to geeſe.

AETIANS, in church-hiſtory, a branch of Arians who maintained, that the Son and Holy Ghoſt are in all things diſſimilar to the Father. See Aetius.

ÆTIOLOGY, is that part of Pathology which is employed in exploring the cauſes of diſeaſes.

AETION, a celebrated painter, who has left us an excellent picture of Roxana and Alexander, which he exhibited at the Olympic Games: it repreſents a magnificent chamber, where Roxana is ſitting on a bed of a moſt ſplendid appearance, which is rendered ſtill more brilliant by her beauty. She looks downwards, in a kind of confuſion, being ſtruck with the preſence of Alexander ſtanding before her. A number of little Cupids flutter about, ſome holding up the curtain, as if to ſhow Roxana to the prince, whilſt others are buſied in undreſſing the lady; ſome pull Alexander by the cloak, who appears like a young baſhful bridegroom, and preſent him to his miſtreſs; he lays his crown at her feet, being accompanied by Epheſtion, who holds a torch in his hand, and leans upon a youth, who repreſents Hymen. Several other little Cupids are repreſented playing with his arms; ſome carry his lance, ſtooping under ſo heavy a weight; others bear along his buckler, upon which one of them is ſeated, whom the reſt carry in triumph; another lies in ambuſh in his armour, waiting to frighten the reſt as they paſs by. This picture gained Aetion ſo much reputation, that the preſident of the games gave him his daughter in marriage.

ÆTITES, or Eagle-stone, in natural hiſtory, a flinty or cruſtated ſtone, hollow within, and containing a *nucleus*, which, on ſhaking, rattles within. It was formerly in repute for ſeveral extraordinary magical as well as medical powers; ſuch as preventing abortion, diſcovering thieves, and other ridiculous properties. The word is formed from αετος, "eagle;" the popular tradition being, that it is found in the eagle's neſt, whether it is ſuppoſed to be carried while the female ſits, to prevent her eggs from being rotten. It is found in ſeveral parts: near Trevoux in France, one can ſcarce dig a few feet, without finding a conſiderable ſtrata or beds of the coarſer or ferruginous kind. They are originally ſoft, and of the colour of yellow ochre. But the fineſt and moſt valued of all the eagle-ſtones, are accidental ſtates of one or other of our common pebbles.

AETIUS, one of the moſt zealous defenders of Arianiſm, was born in Syria, and flouriſhed about the year 336. After being ſervant to a grammarian, of whom he learned grammar and logic, he was ordained deacon, and at length biſhop, by Eudoxus patriarch of Conſtantinople. St Epiphanius has preſerved 47 of his propoſitions againſt the Trinity. His followers were called Aetians.

Aetius, a famous phyſician, born at Amida in Meſopotamia, and the author of a work intitled *Tetrabiblos*, which is a collection from the writings of thoſe phyſicians who went before him. He lived, according to Dr Friend, at the end of the 5th or the beginning of the 6th century.

Aetius, governor of Gallia Narbonenſis in the reign of Valentinian III. forced the Franks who were paſſing into Gaul to repaſs the Rhine. He defeated the Goths; and routed Attila king of the Huns, who invaded Gaul with an army of 700,000 men. But the emperor, jealous of the merit of this great man, killed him in 454 with his own hand, under the pretence that he had permitted the invaſion of the Huns, after Attila's defeat.

ÆTNA, (in the Itineraries *Æthna*, ſuppoſed from αιθω, "to burn;" according to Bochart, from *Athuna*, a furnace, or *Ætuna*, darkneſs), now *Monte Gibello*: a volcano or burning mountain of Sicily, ſituated in lat. 38°. N. long. 15°. E.

This mountain, famous from the remoteſt antiquity, both for its bulk and terrible eruptions, ſtands in the eaſtern part of the iſland, in a very extenſive plain, called *Val Demoni*, from the notion of its being inhabited by devils, who torment the ſpirits of the damned in the bowels of this volcano.

Inconſiſtent accounts concerning the magnitude of Ætna.

Concerning the dimenſions of mount Ætna, we can ſcarce extract any thing conſiſtent, even from the accounts of the lateſt and moſt ingenious travellers. Pindar, who lived about 435 years before Chriſt, calls it the *Pillar of heaven*, on account of its great height. All modern writers likewiſe agree, that this mountain is very high, and very large; but differ exceſſively both as to its height and magnitude: ſome making it no leſs than twelve miles high, others eight, others ſix, ſome four, while Mr Brydone, and Sir William Hamilton, who lately aſcended to its higheſt ſummit, reduce its height to little more than two miles; nay, by ſome it is reduced to 10,036 feet, ſomewhat leſs than two miles. No leſs remarkable are the differences concerning its circumference: ſome making it only 60 miles round, others 100; and Signior Recupero, from whom Mr Brydone had his information in this reſpect, affirms it to be no leſs than 183 miles in circuit.

We are ſorry to detract from the merit of Mr Brydone, or to involve in obſcurity what he hath been at ſo much pains to elucidate; but every perſon who compares the account of mount Ætna's circumference, given by Signior Recupero, and to which Mr Brydone ſeems to have aſſented, with its apparent circumference on the map prefixed to that gentleman's tour through Sicily and Malta, muſt at once be ſtruck with the prodigious diſparity. Indeed, it is plain, that, in the map, the geographer hath not left room for any ſuch mountain; nor can we help thinking, that, by comparing the diſtances of ſome of the Sicilian towns from one another, Signior Recupero's dimenſions will be found enormouſly exaggerated.—Certain it is, that there the geographer hath placed Catania, which ſtands at the foot of mount Ætna, on one ſide, no more than 28 miles from the moſt diſtant point of the river Alcan-

Ætna.

tara, which forms the boundary on the opposite side; so that a circle, whose radius is 14 or 15 miles, must encompass as much space as we can possibly think is occupied by the basis of Mount Ætna. Thus we will reduce the circumference of this famous mountain to between 80 and 90 miles; and even when we do so, it must still be acknowledged to be very great.

But if we are embarrassed with the circumference of Ætna, we are much more so with the accounts relating to its height; and one circumstance, particularly, creates almost insurmountable difficulties. It is agreed upon by all travellers, and among the rest by Sir William Hamilton, that from Catania, where the ascent first begins, to the summit, is no less than 30 miles. The descent on the other side we have no account of; but, whatever supposition we make, the height of the mountain must be prodigious. If we suppose it likewise to be 30 miles, and that mount Ætna can be represented by an equilateral triangle, each of whose sides is 30 miles, we will have an amazing elevation indeed, no less than 26 miles perpendicular!—Such a height being beyond all credibility, we must contract the sides of our triangle, in proportion to its basis. We shall begin with allowing 10 miles for the difference between a straight line from Catania to the summit, and the length of the road, occasioned by the inequalities of the mountain; and supposing the descent on the other side to be somewhat shorter, we may call it 15 miles. Mount Ætna will now be represented by a scalene triangle, whose base is 30 miles, its longest side 20, and its shortest 15; from which proportions we will still find its height to be betwixt eight and nine miles.—This is still incredible; and when all the various relations concerning the height of Ætna are compared, we hope it will not be thought presumptuous in us to give it as our opinion, that the true dimensions of this mountain are as yet unknown. The following measures are given by different authors:

Dimensions uncertain.

Height above the surface of the sea, 10,036 feet.

One hundred and eighty miles circumference at the base.—Faujas de S. Fon in his Volcans du Vivarais.

Height 12,000 feet.—Brydone. Tour to Sicily.

Height 2500 toises.—La Platrière, said as from Recupero.

Height 1950 toises.—Diameter 30 miles.—Mentelle Geogr. comp.

Others make its height only 2000 toises, and its superfices 300 square miles.

General appearance, &c.

Concerning the products and general appearance of this volcano, authors are much better agreed.—The journey from Catania to its summit has been lately described by three travellers, M. D'Orville, Mr Brydone, and Sir William Hamilton. All these agree, that this single mountain affords an epitome of the different climates throughout the whole world: towards the foot, it is very hot; farther up, more temperate; and grows gradually more and more cold the higher we ascend. At the very top, it is perpetually covered with snow: from thence the whole island is supplied with that article, so necessary in a hot climate, and without which the natives say Sicily could not be inhabited. So great is the demand for this commodity, that the bishop's revenues, which are considerable, arise from the sale of mount Ætna's snow; and he is said to draw 1000*l.* a-year from one small portion lying on the north side of the mountain. Great quantities of snow and ice are likewise exported to Malta and Italy, making a considerable branch of commerce. On the north side of this snowy region, Mr Brydone was assured, that there are several small lakes which never thaw; and that the snow mixed with the ashes and salt of the mountain are accumulated to a vast depth. The quantity of salts contained in this mountain, he, with great probability, conjectures to be one reason of the preservation of its snows; for salt increases the coldness of snow to a surprising degree*.

* See *Cold*, and *Congelation*.

In the middle of the snowy regions stands the great *crater*, or mouth of Ætna; from which, though contrary to the usual method of travellers, we shall begin our particular account of this mountain. Sir William Hamilton describes the crater as a little mountain about a quarter of a mile perpendicular, and very steep, situated in the middle of a gently inclining plain, of about nine miles in circumference. It is entirely formed of stones and ashes; and, as Mr Hamilton was informed by several people of Catania, had been thrown up about 25 or 30 years before the time (1769) he visited mount Ætna. Before this mountain was thrown up, there was only a prodigious large chasm, or gulph, in the middle of the abovementioned plain; and it has been remarked, that about once in 100 years the top of Ætna falls in; which undoubtedly must be the case at certain periods, or the mountain behoved continually to increase in height. As this little mountain, though emitting smoke from every pore, appeared solid and firm, Mr Hamilton and his companions went up to the very top. In the middle is a hollow, about two miles and a half in circumference, according to Mr Hamilton; three miles and a half, according to Mr Brydone; and three or four, according to Mr D'Orville. The inside is crusted over with salts and sulphur of different colours. It goes shelving down, from the top, like an inverted cone; the depth, in Mr Hamilton's opinion, nearly corresponding to the height of the little mountain. From many places of this space issue volumes of sulphureous smoke, which being much heavier than the circumambient air, instead of ascending in it, roll down the side of the mountain, till, coming to a more dense atmosphere, it shoots off horizontally, and forms a large tract in the air, according to the direction of the wind; which, happily for our travellers, carried it exactly to the side opposite to which they were placed. In the middle of this funnel is the tremendous and unfathomable gulph, so much celebrated in all ages, both as the terror of this life, and the place of punishment in the next. From this gulph continually issue terrible and confused noises, which in eruptions are increased to such a degree as to be heard at a prodigious distance. Its diameter is probably very different at different times: for Mr Hamilton observed, by the wind clearing away the smoke from time to time, that the inverted hollow cone was contracted almost to a point; while Mr D'Orville and Mr Brydone found the opening very large. Both Mr Brydone and Mr Hamilton found the crater too hot to descend into it; but Mr D'Orville was bolder: and accordingly he and his fellow-traveller, fastened to ropes which two or three men held at a distance for fear of accidents, descended as near as possible to the brink of the gulph; but the small flames and smoke which issued from it on every side, and a greenish sulphur, and pumice-stones, quite black, which covered the margin, would not permit them to come so near

Crater described.

as to have a full view. They only saw distinctly in the middle, a mass of matter which rose, in the shape of a cone, to the height of about 60 feet, and which towards the base, as far as their sight could reach, might be 600 or 800. While they were observing this substance, some motion was perceived on the north side, opposite to that whereon they stood; and immediately the mountain began to send forth smoke and ashes. This eruption was preceded by a sensible increase of its internal roarings; which, however, did not continue; but after a moment's dilatation, as if to give it vent, the volcano resumed its former tranquillity; but as it was by no means proper to make a longer stay in such a place, our travellers immediately returned to their attendants.

On the summit of mount Ætna, Mr Hamilton observes, that he was sensible of a difficulty in respiration from the too great subtility of the air, independent of what arose from the sulphureous smoke of the mountain. Mr Brydone takes no notice of this, which probably arose from the air being in a more rarefied state at the time of Mr Hamilton's observations than of Mr Brydone's; the barometer, as observed by the former, standing at 18 inches and 10 lines, by the latter at 19 inches 6½ lines.

In these high regions there is generally a very violent wind, which, as all our travellers found it constantly blowing from the south, may possibly be commonly directed from that point. Here Mr Brydone's thermometer fell to 27°.

Splendor of the stars seen from the top of Ætna.

The top of Ætna being above the common region of vapours, the heavens appear with exceeding great splendor.—Mr Brydone and his company observed, as they ascended in the night, that the number of stars seemed to be infinitely increased, and the light of each of them appeared brighter than usual; the whiteness of the milky-way was like a pure flame which shot across the heavens; and, with the naked eye, they could observe clusters of stars that were invisible from below. Had Jupiter been visible, he is of opinion that some of his satellites might have been discovered with the naked eye, or at least with a very small pocket-glass. He likewise took notice of several of those meteors called *falling stars*; which appeared as much elevated as when viewed from the plain: a proof, according to Mr Brydone, that "these bodies move in regions "much beyond the bounds that some philosophers "have assigned to our atmosphere."

Extensive prospect.

To have a full and clear prospect from the summit of mount Ætna, it is necessary to be there before sunrise: as the vapours raised by the sun, in the day-time, will obscure every object: accordingly, our travellers took care to arrive there early enough; and all agree, that the beauty of the prospect from thence cannot be expressed.—Here Mr Brydone and Mr Hamilton had a view of Calabria in Italy, with the sea beyond it; the Lipari islands, and Stromboli a volcano at about 70 miles distance, appeared just under their feet; the whole island of Sicily, with its rivers, towns, harbours, &c. appeared distinct, as if seen on a map. Massa, a Sicilian author, affirms, that the African coast, as well as that of Naples, with many of its islands have been discovered from the top of Ætna. The visible horizon here is not less than 8 or 900 miles in diameter. The pyramidal shadow of the mountain reaches across the whole island, and far into the sea on the other side, forming a visible tract in the air, which, as the sun rises above the horizon, is shortened, and at last confined to the neighbourhood of Ætna. The most beautiful part of the scene, however, in Mr Brydone's opinion, is the mountain itself, the island of Sicily, and the numerous islands lying round it. These last seem to be close to the skirts of Ætna; the distances appearing reduced to nothing.

Division into three zones.

This mountain is divided into three zones, which might properly enough be distinguished by the names of *torrid*, *temperate*, and *frigid*: they are, however, known by the names of the *Piedmontese*, or *Regione culta*, the cultivated or fertile region; the *Sylvosa*, woody, or temperate zone; and the *Regione deserta*, the frigid, or desert zone, or region. All these are plainly distinguished from the summit.

Regione deserta.

The *Regione deserta* is marked out by a circle of snow and ice, which extends on all sides to the distance of about eight miles, beginning at the foot of the crater. Greatest part of this region is smooth and even. This is immediately succeeded by the *Sylvosa*, or woody region; which forms a circle of the most beautiful green, surrounding the mountain on all sides. This region is variegated with a vast number of mountains of a conical form, thrown up by Ætna in those eruptions which burst out from its sides. Mr Hamilton counted 44 on the Catania side, each having its crater, many with large trees flourishing both within and without the craters. All these except a few of late date, have acquired a wonderful degree of fertility. The circumference of this zone, or great circle, according to Recupero, is not less than 70 or 80 miles. It is everywhere succeeded by the *Regione culta*: which is much broader than the rest, and extends on all sides to the foot of the mountain. Here terrible devastations are sometimes committed by the eruptions; and the whole region is likewise full of conical mountains thrown up by them. The circumference of this region, is, by Recupero, reckoned 183 miles; but we have already given our reasons for rejecting these dimensions.—This region is bounded by the sea to the south and south-east; and on all other sides, by the river Semetus and Alcantara, which form the boundaries of mount Ætna.

Il Torre del Filosofo.

About a mile below the foot of the great crater, are found the ruins of an ancient structure, called *Il Torre del Filosofo*, by some supposed to have been built by the philosopher Empedocles, who took up his habitation here, the better to study the nature of mount Ætna. By others they are supposed to be ruins of a temple of Vulcan. They are of brick, and seem to have been ornamented with marble. Some where in this region also, Mr D'Orville found a great oblong block of polished marble, eight or ten feet high, and three or four thick; though how it came there was quite unaccountable to him. From Mr D'Orville's and Mr Brydone's accounts we must reckon this part of the mountain pretty steep: but Mr Hamilton says, that the ascent was so gradual, as not to be in the least fatiguing; and had it not been for the snows, they might have rode on their mules to the very foot of the crater.

Regione Sylvosa.

The woody region descends eight or nine miles below the *Regione deserta*, but differs greatly in the temperature of the climate. Mr Hamilton observed a gradual decrease of the vegetation as he advanced; the under part being covered with large timber trees, which grew gradually less as he approached the third region, at last they degenerated into the small plants of the northern climates. He also observed quantities of juniper and tansey; and was informed by his guide, that later in the season (he visited Ætna in June 1769) there are a great many curious plants, and in some places rhubarb and saffron in great plenty. In Carrera's history of Catania, there is a list of all the plants and herbs of Ætna, in alphabetical order.

This region is extolled by Mr. Brydone as one of the most delighful spots on earth. He lodged for a night in a large cave near the middle, formed by one of the most ancient lavas. It is called *La Spelonca del Capriole*, or the goats cavern; because it is frequented by those animals, which take refuge there in bad weather. Here his rest was disturbed by a mountain thrown up in the eruption 1766. It discharged great quantities of smoke, and made several explosions like heavy cannon fired at a distance; but they could observe no appearance of fire.

This gentleman likewise visited the eastern side of the *Regione sylvosa*, intending to have ascended that way to the summit, and descended again on the south side to Catania; but found it impracticable; though what the insurmountable difficulties were, he does not mention. On this side, part of the woody region was destroyed, in 1755, by an immense torrent of boiling water which issued from the great crater. Its traces were still very visible, about a mile and a half broad, and in some places more. The soil was then only beginning to recover its vegetative power, which it seems this torrent had destroyed for 14 years.—Near this place are some beautiful woods of cork, and evergreen oak, growing absolutely out of the lava, the soil having hardly filled the crevices, and not far off our traveller observed 7 little mountains that seemed to have been formed by a late eruption. Each of these had a regular cup, or crater, on the top; and, in some, the middle gulph, or *Voraginæ*, as the Sicilians call it, was still open. Into these gulphs Mr Brydone tumbled down stones, and heard the noise for a long time after. All the fields round, to a considerable distance, were covered with large burnt stones discharged from these little volcanoes.

Eruption of boiling water.

The woody region, especially the east side, called *Carpinetto*, abounds with very large chesnut-trees; the most remarkable of which has been called, from its size, *Castagno de Cento Cavalli*, or chesnut-tree of an hundred horse. M. Brydone was greatly disappointed at the sight of this tree, as it is only a bush of five large ones growing together: but his guides assured him, that all these five were once united into one stem; and Signior Recupero told him, that he himself had been at the expence of carrying up peasants with tools to dig round this bush of trees, and found all the stems united below ground in one root. The circumference, as measured by Messrs Brydone and Glover, who accompanied him, amounted to 204 feet. Another of these, about a mile and a half higher on the mountain, is called *Castagna del Galea*: it rises from one solid stem to a considerable height; after which it branches out, and is a much finer object than the other: this was measured two feet above the ground, and found to be 76 feet in circumference. A third, called *Castagna del Nave*, is pretty nearly of the same size; and Massa, one of the most esteemed Sicilian authors, affirms that he has seen solid oaks there upwards of 40 feet round. All these grow on a thick rich soil, which seems originally to have been formed of ashes thrown out by the mountain. Here the barometer stood at 26 inches 5 lines and an half, indicating an elevation of near 4000 feet.

Over-grown chesnut-trees.

The Piedmontese district is covered with towns, villages, monasteries, &c. and is well peopled, notwithstanding the danger of such a situation: but the fertility of the soil tempts people to inhabit that country; and their superstitious confidence in their saints, with the propensity mankind have to despise danger which they do not see, render them as secure there as in any other place. Here, Sir William Hamilton observes, they keep their vines low, contrary to the custom of those who inhabit mount Vesuvius; and they producea stronger wine, but not in such abundance: here also many terrible eruptions have burst forth; particularly one in 1669. At the foot of the mountain raised by that eruption, is a hole, through which Sir William Hamilton descended, by means of a rope, into several subterraneous caverns, branching out and extending much farther than he chose to venture, the cold there being excessive, and a violent wind extinguishing some of the torches. Many other caverns are known in this and the other regions of Ætna; particularly one near this place called *La Spelonca della Palomba*, (from the wild pidgeons building their nests there.) Here Mr Brydone was told that some people had lost their senses, from having advanced too far, imagining they saw devils and damned spirits.—Some of these caverns are made use of as magazines for snow; which they are well adapted for, on account of their extreme cold. These are with great probability supposed by Sir William Hamilton to be the hollows made by the issuing of the lava in eruptions.

Regione Culta.

Subterraneous caverns.

In this region the river *Acis*, so much celebrated by the poets, in the fable of Acis and Galatea, takes its rise. It bursts out of the earth at once in a large stream, runs with great rapidity, and about a mile from its source throws itself into the sea. Its water is remarkably clear; and so extremely cold, that it is reckoned dangerous to drink it: It is said, however to have a poisonous quality, from being impregnated with vitriol; in consequence of which cattle have been killed by it. It never freezes, but is said often to contract a greater degree of cold than ice.

River Acis.

Having thus given an account of this mountain in its quiet and peaceable state, we must now describe the appearance it puts on during the time of an eruption, when it spreads destruction for many miles round, and is capable of striking the boldest with terror.

Appearances during an eruption.

Sir William Hamilton, who has examined both Vesuvius and Ætna in a very accurate manner, never had an opportunity of seeing an eruption of the latter; but as he is of opinion that the two volcanoes agree perfectly in all respects, only that the latter is on a much larger scale than the former, we hope it will not be unacceptable to our readers to give an account of some of the general appearances of Vesuvius when in a state of eruption, the better to help their ideas concerning Ætna.

It has been already observed, that a smoke constantly issues from the top of Ætna, and that its internal noises never cease. The case is the same with Vesuvius:

Ætna.

vius: and Sir William Hamilton obſerved, that in bad weather the ſmoke was more conſiderable, as well as the noiſe much louder, than when it was fair; ſo that in bad weather he had frequently heard the inward exploſions of the mountain at Naples ſix miles diſtant from Veſuvius. He alſo obſerved the ſmoke that iſſued from the mountain in bad weather to be very white, moiſt, and not near ſo offenſive as the ſulphureous ſteams from various cracks in the ſide of the mountain.

Signs of an approaching eruption.

The firſt ſymptom of an approaching eruption is an increaſe of the ſmoke in fair weather: after ſome time, a puff of black ſmoke is frequently ſeen to ſhoot up in the midſt of the white to a conſiderable height. Theſe puffs are attended with conſiderable exploſions: for while Veſuvius was in this ſtate, Sir William Hamilton went up to its top, which was covered with ſnow; and perceiving a little hillock of ſulphur, about ſix feet high, which had been lately thrown up, and burnt with a blue flame at the top, he was examining this phenomenon, when ſuddenly a violent report was heard, a column of black ſmoke ſhot up with violence, and was followed by a reddiſh flame. Immediately a ſhower of ſtones fell; upon which he thought proper to retire. Phenomena of this kind, in all probability, precede the eruptions of Ætna in a much greater degree.—The ſmoke at length appears wholly black in the day-time, and in the night has the appearance of flame; ſhowers of aſhes are ſent forth, earthquakes are produced, the mountain diſcharges volleys of red-hot ſtones to a great height in the air. The force by which theſe ſtones are projected, as well as their magnitudes, ſeems to be in proportion to the bulk of the mountain. Signior Recupero aſſured Mr Brydone, that he had ſeen immenſely large ones thrown perpendicularly upwards to the height of 7000 feet, as he calculated from the time they took to arrive at the earth after beginning to deſcend from their greateſt elevation. The largeſt ſtone, or rather rock, that was ever known to be emitted by Veſuvius, was 12 feet long and 45 in circumference. This was thrown a quarter of a mile; but much larger ones have been thrown out by mount Ætna, almoſt in the proportion in which the latter exceeds Veſuvius in bulk. Along with theſe terrible ſymptoms, the ſmoke that iſſues from the crater is ſometimes in a highly electrified ſtate. In this caſe, the ſmall aſhes which are continually emitted from the crater, are attracted by the ſmoke, and riſe with it to a great height, forming a vaſt black, and to appearance denſe, column; from this column continual flaſhes of forked or zig-zag lightning iſſue, ſometimes attended with thunder, and ſometimes not, but equally powerful with ordinary lightning. This phenomenon was obſerved by Sir William Hamilton in the ſmoke of Veſuvius, and has alſo been taken notice of in that of Ætna; and where this electrified ſmoke hath ſpread over a tract of land, much miſchief hath been done by the lightning proceeding from it.

Hamilton's Obſervations, p. 4.

Thunder & lightning from the ſmoke.

When theſe dreadful appearances have continued ſometimes four or five months, the *lava* begins to make its appearance. This is a ſtream of melted mineral matters, which in Veſuvius commonly boils over the top, but very ſeldom does ſo in Ætna; owing to the great weight of the lava, which long before it can be raiſed to the vaſt height of mount Ætna, burſts out through ſome weak place in its ſide. Upon the appearance of the lava, the violent eruptions of the mountain generally, though not always, ceaſe; for if this burning matter gets not ſufficient vent, the commotions increaſe to a prodigious degree.—In the night-time the lava appears like a ſtream of fire, accompanied with flame: but in the day time it has no ſuch appearance; its progreſs is marked by a white ſmoke, which by the reflection of the red-hot matter in the night aſſumes the appearance of flame.

Eruption in 1669.

All the abovementioned ſymptoms preceded the great eruption of Ætna in 1669. For ſeveral months before the lava broke forth, the *old mouth*, or great crater on the ſummit, was obſerved to ſend forth great quantities of ſmoke and flame; the top had fallen in, ſo that the mountain was much lowered; the iſlands alſo of Volcan and Stromboli, two volcanoes to the weſtward of Sicily, were obſerved to rage more than uſual.—Eighteen days before the eruption, the ſky was very thick and dark, with thunder, lightning, frequent concuſſions of the earth, and dreadful ſubterraneous bellowings. On the 11th of March, ſome time before the lava got vent, a rent was opened in the mountain twelve miles in length, into which, when ſtones were thrown down, they could not be heard to ſtrike the bottom. Burning rocks, 60 palms (15 of our feet) in length, were thrown to the diſtance of a mile; others of a leſſer ſize were carried three miles off; the internal noiſes of the mountain were exceedingly dreadful, and the thunder and lightning from the ſmoke ſcarce leſs terrible than they. When the lava at laſt got vent, it burſt out of a vineyard, 20 miles below the great crater, and ſprung up into the air to a conſiderable height. Here it formed a mountain of ſtones and aſhes, not leſs, as Sir W^m^ Hamilton conjectures, than half a mile perpendicular in height, and three miles in circumference. For 54 days neither ſun nor ſtars had appeared: but ſoon after the lava got vent, the mountain became very quiet. The terrible effects of this fiery ſtream may be imagined from its amazing extent; being, as Sir W^m^ Hamilton obſerves, no leſs than 14 miles long, and in many places ſix in breadth. In its courſe, it deſtroyed the habitations of near 30,000 perſons; and meeting with a lake four miles in compaſs, it not only filled it up, though ſeveral fathom deep, but made a mountain in the place of it. Having reached Catanea, it deſtroyed part of its walls, and ran for a conſiderable length into the ſea, forming a ſafe and beautiful harbour; which, however, was ſoon filled up by a freſh torrent of the ſame inflamed matter.

Phenomena at the breaking forth of the lava.

It is not eaſy for thoſe who have never been preſent at thoſe terrible operations of nature, to repreſent to their minds the horrors which muſt attend the breaking forth of the lava; for though the giving vent to this burning matter generally produces a ceſſation of the violent efforts of the internal fire, yet at the very inſtant of its exploſion ſcarce any thing can be conceived ſo dreadful. See Vesuvius.

Hamilton's obſervations, p. 10.

When the lava firſt iſſues, it appears very fluid, and runs with the rapidity of a ſwift river; but even then it ſurpriſingly reſiſts the impreſſion of ſolid bodies: for Sir W^m^ Hamilton could not pierce that of Veſuvius with a ſtick driven againſt it with all his force; nor did the largeſt ſtone he was able to throw upon it ſink, but made a ſlight impreſſion, and then floated along. This happened almoſt at the very mouth, when the lava appeared

Ætna.

ed liquid as water, and when he saw it running with a rapidity equal to the river Severn at the passage near Bristol.—A description of the lava issuing from mount Ætna in 1669 was sent to the court of England by Lord Winchelsea, who at that time happened to be at Catania in his way home from an embassy at Constantinople. His account is not now to be procured; but Mr Hamilton found a copy in Sicily, and hath given an extract, part of which follows. "When it was night, I went upon two towers in different places; and I could plainly see, at ten miles distance, as we judged, the fire begin to run from the mountain in a direct line, the flame to ascend as high and as big as one of the greatest steeples in your Majesty's kingdoms, and to throw up great stones into the air; I could discern the river of fire to descend the mountain of a terrible fiery or red colour, and stones of a paler red to swim thereon, and to be some as big as an ordinary table. We could see this fire to move in several other places, and all the country covered with fire, ascending with great flames in many places, smoking like to a violent furnace of iron melted, making a noise with the great pieces that fell, especially those that fell into the sea. A cavalier of Malta, who lives there, and attended me told me, that the river was as liquid, where it issues out of the mountain, as water, and came out like a torrent with great violence, and is five or six fathom deep, and as broad, and that no stones sink therein."

Lava of 1669 described.

The account given in the Philosophical Transactions is to the same purpose. We are there told, that the lava is "nothing else than divers kinds of metals and minerals, rendered liquid by the fierceness of the fire in the bowels of the earth, boiling up and gushing forth as the water doth at the head of some great river; and having run in a full body for a stone's cast or more, began to crust or curdle, becoming, when cold, those hard porous stones which the people call *Sciarri*." Those, though cold in comparison of what first issues from the mountain, yet retained so much heat as to resemble huge cakes of sea-coal strongly ignited, and came tumbling over one another, bearing down or burning whatever was in their way.—In this manner the lava proceeded slowly on till it came to the sea, when a most extraordinary conflict ensued betwixt the two adverse elements. The noise was vastly more dreadful than the loudest thunder, being heard thro' the whole country to an immense distance; the water seemed to retire and diminish before the lava, while clouds of vapour darkened the sun. The whole fish on the coast were destroyed, the colour of the sea itself was changed, and the transparency of its waters lost for many months.

While this lava was issuing in such prodigious quantity, the merchants, whose account is recorded in the Philosophical Transactions, attempted to go up to the mouth itself; but durst not come nearer than a furlong, lest they should have been overwhelmed by a vast pillar of ashes, which to their apprehension exceeded twice the bigness of St Paul's steeple in London, and went up into the air to a far greater height; at the mouth itself was a continual noise, like the beating of great waves of the sea against rocks, or like distant thunder, which sometimes was so violent as to be heard 60, or even 100 miles off; to which distance also part of the ashes were carried. Some time after, having gone up, they found the mouth from whence this terrible deluge issued to be only a hole about 10 feet diameter. This is also confirmed by Mr Brydone; and is probably the same through which Sir W^m Hamilton descended into the subterranean caverns already mentioned.

Diameter of the hole whence the lava issued.

Antiquity of the eruptions.

Mount Ætna, as we have already remarked, has been a celebrated volcano from the remotest antiquity. Diodorus Siculus mentions eruptions of it as happening 500 years before the Trojan war, or 1693 years before the Christian æra. From Homer's silence with regard to the phenomenon of Ætna, it is to be presumed that the volcano had been many ages in a state of inactivity, and that no tradition of its burning remained among the inhabitants at the time he composed his Odyssey; perhaps it never had emitted flames since the country was peopled. The first eruption taken notice of by ancient, but by no means cotemporary authors, happened before the Greeks landed on the island, and is supposed to have scared the Sicani from the east part of Sicily.

Pindar, quoted above, is the oldest writer extant who speaks of Ætna as a volcano. The first recorded eruption was in the time of Pythagoras. Plato was invited by the younger Dionysius to examine the state of the mountain after the sixth. It threw up flames and lava near an hundred times between that period and the battle of Pharsalia; it was particularly furious while Sextus Pompeius was adding the horrors of war to its devastations. Charlemagne happened to be at Catania during one of the eruptions; and from his reign the chronicles mention fifteen down to that of the year 1669, the most terrible of them all. Since 1669 there have been several eruptions, but none of them comparable to it. In that which happened in 1766, the lava sprang up into the air to a considerable height, twelve miles below the summit; but formed a stream only six miles in length and one mile in breadth.

Account of the late eruption, 1787.

The last eruption happened in 1787. From the 1st to the 10th of July, there were signs of its approach. On the 11th, after a little calm, there was a subterraneous noise, like the sound of a drum in a close place, and it was followed by a copious burst of black smoke. It was then calm till the 15th, when the same prognostics recurred. On the 17th, the subterraneous noise was heard again; the smoke was more abundant, slight shocks of an earthquake followed, and the lava flowed from behind one of the two little mountains which form the double head of Ætna. On the 18th, while the spectators were in anxious expectation of a more severe eruption, all was quiet, and continued so more than 12 hours: soon after they perceived some new shocks, accompanied with much noise; and the mountain threw out a thick smoak, which, as the wind was westerly, soon darkned the eastern horizon: two hours afterwards a shower of fine black brilliant sand descended: on the east side it was a storm of stones; and, at the foot of the mountain, a deluge of flashes of fire, of scoria and lava.

These appearances continued the whole day; at the setting of the sun the scene changed. A number of conical flames rose from the volcano; one on the north, another on the south, were very conspicuous, and rose and fell alternately. At three in the morning, the mountain appeared cleft, and the summit seemed a burning mass. The cones of light which arose from the crater were of an immense extent, particularly the two just

just mentioned. The two heads seemed to be cut away; and at their separation was a cone of flame, seemingly composed of many lesser cones. The flame seemed of the height of the mountain placed on the mountain; so that it was probably two miles high, on a base of a mile and a half in diameter. This cone was still covered with a very thick smoke, in which there appeared very brilliant flashes of lightning, a phenomenon which Ætna had not before afforded. At times, sounds like those from the explosion of a large cannon were heard seemingly at a less distance than the mountain. From the cone, as from a fountain, a jet of many flaming volcanic matters were thrown, which were carried to the distance of six or seven miles: from the base of the cone a thick smoke arose, which, for a moment, obscured some parts of the flame, at the time when the rivers of lava broke out. This beautiful appearance continued three quarters of an hour. It began the next night with more force; but continued only half an hour. In the intervals, however, Ætna continued to throw out flames, smoke, stones ignited, and showers of sand. From the 20th to the 22d, the appearances gradually ceased. The stream of lava was carried towards Bronte and the plain of Lago.

After the eruption, the top of the mountain on the western side was found covered with hardened lava, scoria, and stones. The travellers were annoyed by smoke, by showers of sand, mephitic vapours, and excessive heat. They saw that the lava which came from the western point divided into two branches, one of which was directed towards Libeccio; the other, as we have already said, towards the plain of Lago. The lava on the western head of the mountain, had from its various shapes been evidently in a state of fusion: from one of the spiracula, the odour was strongly that of liver of sulphur. The thermometer, in descending, was at 40 degrees of Farenheit's scale; while near the lava, in the plain of Lago, it was 140 degrees. The lava extended two miles; its width was from $13\frac{3}{4}$ to 21 feet, and its depth $13\frac{3}{4}$ feet.

These are the most remarkable circumstances we have been able to collect, that might serve to give an adequate idea of this famous mountain.—Many things, however, concerning the extent, antiquity, *&c.* of the lavas, remain to be discussed, as well as the opinions of philosophers concerning the origin of the internal fire which produces so much mischief: but the consideration of these belongs to the general article Volcano, to which the reader is referred.—The fate of *Catania* and *Hybla*, which have often been destroyed by eruptions, will be mentioned under these two words.

Ætna salt, Sal Ætnæ, a name given by some authors to the sal ammoniac, which is found on the surface and sides of the openings of Ætna, and other burning mountains after their eruptions; and sometimes on the surface of the ferruginous matter which they throw out. This salt makes a very various appearance in many cases; it is sometimes found in large and thick cakes, sometimes only in form of a thick powder, scattered over the surface of the earth and stones. Some of this salt is yellow, some white, and some greenish. This salt is a concrete of nitre, sulphur, and vitriol, burnt and sublimed together; Borelli found once a vast quantity of this salt on mount Ætna, and tried many experiments on it: from whence he concluded, that this salt is so far from occasioning the explosions of that mountain, as some have supposed, that it does not exist in it, but is formed during the burning. Phil. Transf. N° 100.

ÆTOLARCHA, in Grecian antiquity, the principal magistrate or governor of the Ætolians.

AFER (Domitius), a famous orator, born at Nismes, flourished under Tiberius and the three succeeding emperors. Quintilian makes frequent mention of him, and commends his pleadings. But he disgraced his talents, by turning informer against some of the most distinguished personages in Rome. Quintilian, in his youth, cultivated the friendship of Domitius very assiduously. He tells us that his pleadings abounded with pleasant stories, and that there were public collections of his witty sayings, some of which he quotes. He also mentions two books of his "*On Witnesses*." Domitius was once in great danger from an inscription he put upon a statue erected by him in honour of Caligula, wherein he declared that this prince was a second time a consul at the age of 27. This he intended as an encomium, but Caligula taking it as a sarcasm upon his youth, and his infringment of the laws, raised a process against him, and pleaded himself in person. Domitius instead of making a defence, repeated part of the emperor's speech with the highest marks of admiration; after which he fell upon his knees, and, begging pardon, declared, that he dreaded more the eloquence of Caligula than his imperial power. This piece of flattery succeeded so well, that the emperor not only pardoned, but also raised him to the consulship. Afer died in the reign of Nero, A. D. 59.

AFFA, a weight used on the Gold Coast of Guinea. It is equal to an ounce, and the half of it is called *eggeba*. Most of the blacks on the Gold Coast give these names to those weights.

AFFECTION, in a general sense, implies an attribute inseparable from its subject. Thus magnitude, figure, weight, &c. are affections of all bodies; and love, fear, hatred, &c. are affections of the mind*.

Affection, signifying *a settled bent of mind toward a particular being or thing*, occupies a middle space between *disposition* on the one hand, and *passion* on the other †. It is distinguishable from Disposition, which being a branch of one's nature, originally, must exist before there can be an opportunity to exert it upon any particular object; whereas Affection can never be original, because, having a special relation to a particular object, it cannot exist till the object has once at least been presented. It is also distinguishable from Passion, which, depending on the real or ideal presence of its object, vanishes with its object: whereas Affection is a lasting connection; and, like other connections, subsists even when we do not think of the person. A familiar example will illustrate this. There may be in one person's mind a disposition to gratitude, which, through want of an object, happens never to be exerted; and which therefore is never discovered even by the person himself. Another, who has the same disposition, meets with a kindly office that makes him grateful to his benefactor: An intimate connection is formed between them, termed *affection*: which, like other connections, has a permanent existence, though not always in view. The af-

*See *Moral Philosophy*, Part I. sec. i. iv.

† See *Disposition*, and *Passion*.

affection, for the moſt part, lies dormant, till an opportunity offer for exerting it: in that circumſtance, it is converted into the paſſion of gratitude; and the opportunity is eagerly ſeized of teſtifying gratitude in the warmeſt manner.

Affection, among phyſicians, ſignifies the ſame as diſeaſe. Thus the hyſteric *affection* is the ſame with the hyſteric diſeaſe.

AFFERERS, or Afferors, in law, perſons appointed in court-leets, courts baron, &c. to ſettle, upon oath, the fines to be impoſed upon thoſe who have been guilty of faults arbitrarily puniſhable.

AFFETUOSO, or *Con Affetto*, in the Italian muſic, intimates that the part to which it is added ought to be played in a tender moving way, and conſequently rather ſlow than faſt.

AFFIANCE, in law, denotes the mutual plighting of troth between a man and woman to marry each other.

AFFIDAVIT, ſignifies an oath in writing, ſworn before ſome perſon who is authoriſed to take the ſame.

AFFINITY, among civilians, implies a relation contracted by marriage; in contradiſtinction to conſanguinity, or relation by blood. Affinity does not found any real kinſhip; it is no more than a kind of fiction, introduced on account of the cloſe relation between huſband and wife. It is even ſaid to ceaſe when the cauſe of it ceaſes: hence a woman who is not capable of being a witneſs for her huſbaud's brother during his lifetime, is allowed for a witneſs when a widow, by reaſon the affinity is diſſolved. Yet with regard to the contracting marriage, affinity is not diſſolved by death, though it be in every thing elſe.

There are ſeveral degrees of affinity, wherein marriage was prohibited by the law of Moſes: thus, the ſon could not marry his mother, nor his father's wife (Lev. xviii. 7. et. ſeq.): the brother could not marry his ſiſter, whether ſhe were ſo by the father only or by the mother only, and much leſs if ſhe was his ſiſter both by the ſame father and mother; the grandfather could not marry his grand-daughter, either by his ſon or daughter. No one could marry the daughter of his father's wife; nor the ſiſter of his father or mother. Nor the uncle his niece; nor the aunt her nephew. Nor the nephew the wife of his uncle by the father's ſide. The father-in-law could not marry his daughter-in-law: nor the brother the wife of his brother, while living; nor even after the death of his brother, if he left children. If he left no children, the ſurviving brother was to raiſe up children to his deceaſed brother, by marrying his widow. It was forbidden to marry the mother and the daughter at one time, or the daughter of the mother's ſon, or the daughter of her daughter, or two ſiſters together. It is true the patriarchs before the law married their ſiſters, as Abraham married Sarah, who was his father's daughter by another mother; and two ſiſters together, as Jacob married Rachel and Leah; and their own ſiſters by both father and mother, as Seth and Cain. But theſe caſes are not to be propoſed as examples: becauſe in ſome they were authoriſed by neceſſity; in others by cuſtom; and the law as yet was not in being. If ſome other examples may be found, either before or ſince the law, the ſcripture expreſsly diſapproves of them, as Reuben's inceſt with Balah his father's concubine, and the action of Ammon with his ſiſter Tamar; and that of Herod-Antipas, who married Herodias his ſiſter-in-law, his brother Philip's wife, while her huſband was yet living.

Affinity is alſo uſed to denote conformity or agreement: Thus we ſay, the affinity of languages, the affinity of words, the affinity of ſounds, &c.

Affinity, or Elective Attraction, are terms uſed by modern chemiſts to expreſs that peculiar propenſity which different ſpecies of matter have to unite and combine with certain other bodies excluſively, or in preference to any other connection.

AFFIRMATION, in logic, the aſſerting the truth of any propoſition.

Affirmation, in law, denotes an indulgence allowed to the people called *Quakers*; who, in caſes where an oath is required from others, may make a ſolemn affirmation that what they ſay is true; and if they make a falſe affirmation, they are ſubject to the penalties of perjury.

Affirmation is alſo uſed for the ratifying or confirming the ſentence or decree of ſome inferior court: Thus, in England, they ſay, the houſe of lords affirmed the decree of the lord chancellor, or the decree of the lords of ſeſſion.

AFFIRMATIVE, in grammar. Authors diſtinguiſh affirmative particles; ſuch is, *yes*.—The term *affirmative* is ſometimes alſo uſed ſubſtantively. Thus we ſay, the affirmative is the more probable ſide of the queſtion: there were ſo many votes, or voices, for the affirmative.

AFFIX, in grammer, a particle added at the cloſe of a word, either to diverſify its form or alter its ſignification. We meet with *affixes* in the Saxon, the German, and other northern languages; but more eſpecially in the Hebrew, and other oriental tongues. The Hebrew *affixes* are ſingle ſyllables, frequently ſingle letters, ſubjoined to nouns and verbs; and contribute not a little to the brevity of that language. The oriental languages are much the ſame as to the *radicals*, and differ chiefly from each other as to *affixes* and *prefixes*.

AFFLATUS, literally denotes a blaſt of wind, breath, or vapour, ſtriking with force againſt another body. The word is Latin, formed from *ad* "to," and *flare* "to blow." Naturaliſts ſometimes ſpeak of the afflatus of ſerpents. Tully uſes the word figuratively, for a divine inſpiration; in which ſenſe, he aſcribes all great and eminent accompliſhments to a divine afflatus. The Pythian prieſteſs being placed on a tripod or perforated ſtool, over a holy cave, received the divine afflatus, as a late author expreſſes it, in her belly; and being thus inſpired, fell into agitations, like a phrenetic; during which ſhe pronounced, in hollow groans and broken ſentences, the will of the deity. This afflatus is ſuppoſed, by ſome, to have been a ſubterraneous fume, or exhalation, wherewith the prieſteſs was literally inſpired. Accordingly, it had the effects of a real phyſical diſeaſe; the paroxyſm of which was ſo vehement, that Plutarch obſerves it ſometimes proved mortal. Van Dale ſuppoſes the pretended enthuſiaſm of the Pythia to have ariſen from the fumes of aromatics.

AFFLICTION, is not itſelf, in propriety of medi-

Afforage ‖ Africa. cal speech, a disease, but it produces many: for whatever excites envy, anger, or hatred, produces diseases from tense fibres; as whatever excites fear, grief, joy, or delight, begets diseases from relaxation.

AFFORAGE, in the French customs, a duty paid to the lord of a district, for permission to sell wine, or others liquors, within his seignory. Afforage is also used for the rate or price of provisions laid and fixed by the provost or sheriffs of Paris.

AFFORESTING, Afforestatio, the turning ground into forest. The Conqueror, and his successors, continued afforesting the lands of the subject for many reigns; till the grievance became so notorious, that the people of all degrees and denominations were brought to sue for relief; which was as length obtained, and commissions were granted to survey and perambulate the forest, and separate all the new afforested lands, and re-convert them to the uses of their proprietors, under the name and quality of *purlieu* or *pouralle land*.

AFFRAY, or Affrayment, in law, formerly signified the crime of affrighting other persons, by appearing in unusual armour, brandishing a weapon, &c. but, at present, *affray* denotes a skirmish or fight between two or more.

AFFRONTEE, in heraldry, an appellation given to animals facing one another on an escutcheon; a kind of bearing which is otherwise called *confrontee*, and stands opposed to *adossee*.

AFFUSION, the act of pouring some fluid substance on another body. Dr Grew gives several experiments of the luctation arising from the affusion of divers menstruums on all sorts of bodies. Divines and church historians speak of baptism by affusion; which amounts to much the same with what we now call *sprinkling*.

AFRANIUS, a Latin poet, who wrote comedies in imitation of Menander, commended by Tully and Quintilian: he lived in the 170th Olympiad.

AFRICA (according to Bochart, from a Punic word, signifying *Ears of Corn*); one of the four great divisions, by the moderns called *quarters*, of the world, and one of the three called by the Greeks Ηπειροι, or *continents*. By them it was also called *Libya*.

Africa lies south of Europe, and west of Asia. It is bounded on the north by the Mediterranean, which separates it from the former; on the north-east, by the Red Sea, which divides it from Asia, and to which it is attached by a neck of land called the *Isthmus of Suez*, about 60 miles over, separating the Mediterranean from the Red Sea. On the west, south, and east, it is bounded by the main ocean: so that it is properly a vast peninsula, bearing some faint resemblance of a pyramid, the base of which is the northern part, running along the shores of the Mediterranean; and the top of the pyramid is the most southerly point, called the *Cape of Good Hope*. Its greatest length from north to south is 4300 miles, and its greatest breadth from east to west is 3500 miles; reaching from Lat. 37° N. to 35° S. and from Long. 17° W. to 51° E.

Though the greatest part of this continent hath been in all ages unknown both to the Europeans and Asiatics, its situation is more favourable than either Europe or Asia for maintaining an intercourse with other nations. It stands, as it were, in the centre of the three other quarters of the globe; and has thereby a much nearer communication with Europe, Asia, and America, than any one of these has with another. For, (1.) It is opposite to Europe in the Mediterranean, for almost 1000 miles in a line from east to west; the distance seldom 100 miles, never 100 leagues, and sometimes not above 20 leagues. (2) It is opposite to Asia for all the length of the Red Sea, the distance sometimes not exceeding five leagues, seldom fifty. (3) Its coast for the length of about 2000 miles lies opposite to America at the distance of from 500 to 700 leagues, including the islands: whereas America, unless where it may be a *terra incognita*, is no where nearer Europe than 1000 leagues; and Asia, than 2500.

As the equator divides this continent almost in the middle, the far greatest part of it is within the tropics; and of consequence the heat in some places is almost insupportable by Europeans, it being there greatly increased by vast deserts of burning sand.—It cannot be doubted, however, that, were the country well cultivated, it would be extremely fertile; and would produce in great abundance not only the necessaries, but also the luxuries, of life. It has been asserted, that the sugars of Barbadoes and Jamaica, as also the ginger, cotton, rice, pepper, pimento, cocoa, indigo, &c. of these islands, would thrive in Africa to as much perfection as where they are now produced. Nor can it be doubted, that the East Indian spices, the tea of China and Japan, the coffee of Mocha, &c. would all thrive in some parts of the African coast; as this continent has the advantage of feeling no cold, the climate being either very warm or very temperate.

Whatever may be the case with the internal parts of Africa, it is certain that its coasts are well watered with many very considerable rivers. The Nile and the Niger may be reckoned among the largest in any part of the world, America excepted. The first discharges itself into the Mediterranean, after a prodigious course from its source in Abyssinia. The origin neither of the Nile, nor of the Niger, is certainly known; but that of the latter is supposed to run through a tract of land little less than 3000 miles. Both these rivers annually overflow their banks, fertilizing by that means the countries through which they pass. The Gambia and Senegal rivers are only branches of the Niger. Many vast ridges of mountains also run through different parts of this continent; but their extent is very little known. Some of the most remarkable are, (1.) Those called *Atlas*, lying between the 20th and 25th degree of north latitude, and supposed almost to divide the continent from east to west. (2.) The *mountains of the moon*, so called on account of their great height; supposed to be the boundaries between Abyssinia and some of the interior kingdoms. (3.) The mountains of *Sierra Leona*, so called on account of their abounding with lions, and likewise supposed to be the boundaries of some of the nations. (4) Those called by the ancients the *mountains of God*, on account of their being subject to perpetual thunder and lightning. Of all these, however, little more is known than their names.

To what we have already said concerning the produce of Africa, we may add, that no part of the world abounds with gold and silver in a greater degree. Here also are a prodigious number of elephants; and it is surprising, that neither the ancient nor modern Europeans,

peans, notwithstanding their extravagant and insatiable thirst after gold and silver, should have endeavoured to establish themselves effectually in a country much nearer to them than either America or the East Indies; and where the objects of their desire are found in equal, if not greater, plenty.

Next to gold and silver, copper is the most valuable metal; and on this continent is found in great plenty, insomuch that the mountains of Atlas above mentioned are said all to be composed of copper ore. In short, Africa, though a full quarter of the globe, stored with an inexhaustible treasure, and capable of producing almost every necessary, conveniency, and luxury of life, within itself, seems to be utterly neglected both by its own inhabitants and all other nations: the former, being in a savage state, are incapable of enjoying the blessings offered them by nature; and the latter taking no farther notice of the inhabitants, or their land, than to obtain at the easiest rate what they procure with as little trouble as possible, or to carry them off for slaves to their plantations in America.

Only a small part of this continent was known to the ancients, *viz.* the kingdom of Egypt, and the northern coast, comprehending little more than what is now known by the name of *Barbary*. It was divided into *Africa Propria*, and *Africa Interior*. Africa Propria comprehended only the Carthaginian territories. Africa Interior comprehended all other nations to the southward of these territories, or those at a greater distance from Rome. The only kingdoms, however, with which the Romans had any connection, were the Numidians, the Mauritanians, and the Gætuli. All these, as well as Egypt, were swallowed up by that enormous power, and reduced to the condition of Roman provinces. But the Romans never seem to have penetrated beyond the tropic of cancer. There appears, indeed, to have been some intercourse between them and the Ethiopians: but the latter always preserved their liberty; and we find their queen Candace mentioned in the times of the apostles, when the Roman power was at its highest pitch.

Between the tropic of cancer and the equinoctial line, a multitude of savage nations were supposed to have their residence, known by the names of Melanogætuli, Nigritæ, Blemmyes, Dolopes, Astacuri, Lotophagi, Ichthyophagi, Elephantophagi, &c. (which are taken notice of, as well as the others already mentioned, under their proper names); but that Africa was a peninsula, seems to have been totally unknown both to the Europeans and Asiatics for many ages.—It is probable indeed, that some of the Phenicians, and their offspring the Carthaginians, were not so ignorant; as they carried navigation to a much greater height than either the Greeks or Romans: but their discoveries were all concealed with the greatest care, lest other nations should reap the benefit of them; and accordingly we can now find no authentic accounts concerning them. The navigation round Africa, in particular, is recorded by the Greek and Roman writers rather as a strange amusing tale than as a real transaction; and as neither the progress of the Phenician and Carthaginian discoveries, nor the extent of their navigation, were communicated to the rest of mankind, all memorials of their extraordinary skill in naval affairs seem in a great measure to have perished, when the maritime power of the former was annihilated by Alexander's conquest of Tyre, and the empire of the latter was overturned by the Romans.

That the peninsula of Africa, however, was in reality sailed round by the Phenicians, we have on indisputable authority; for some of that nation undertook the voyage, at the command of Necho king of Egypt, about 604 years before the Christian æra. They sailed from a port in the Red Sea, and after three years returned by the Mediterranean: and the very objections that were made to the veracity of their accounts at that time, are unanswerable proofs to us that this voyage was really accomplished. They pretended, that, having sailed for some time, the sun became more and more vertical, after which he appeared in the north, and seemed to recede from them: that as they returned, the sun gradually seemed to move southwards; and, after becoming vertical once more, appeared then in the south side of them as before they set out. This, which we know must certainly have been the case, was deemed incredible at that time, and universal ignorance concerning the extent of this continent prevailed till the 15th century. The first attempts towards attaining a knowledge of Africa was made by the Portuguese in 1412. Notwithstanding their vicinity, they had never ventured beyond Cape *Non*, situated in about N. lat. 27°.: it had received its name from a supposed impossibility of passing it. This year they proceeded 160 miles farther, to Cape Bojador; which stretching a considerable way into the Atlantic ocean, with rocky clifts, appeared so dreadful to the navigators, that they returned without any attempt to pass it. In an attempt to double this formidable cape, they discovered the Madeira islands in 1419: but Cape Bojador continued to be the boundary of their continental discoveries till 1433; when they penetrated within the tropics, and in a few years discovered the river Senegal, Cape de Verd, and the islands which lie off that promontory. In 1449, the western islands, called the *Azores*, were discovered: and in 1471, they first penetrated beyond the line; and were surprised to find, that the torrid zone, contrary to the opinion of the ancients, who imagined it to be burnt up with heat, was not only habitable, but fertile and populous. In 1484, they proceeded 1500 miles beyond the line; so that they began to entertain hopes of finding that way a passage to the East Indies: and two years afterwards, the Cape of Good Hope was discovered by Bartholomew de Diaz; but it was not till the year 1497, that the Portuguese, under Vasquez de Gama, actually doubled this cape, and discovered the true shape of the continent. Thus the coasts of Africa were made perfectly known; and probably the knowledge concerning its interior parts would have been much greater than it is, had not the general attention been called off from this continent by the discovery of America in 1492.

The Romans for a long time maintained their power in Africa: but in the year 426, Bonifacius, supreme governor of all the Roman dominions in this quarter, being compelled to revolt by the treachery of another general called *Aetius*, and finding himself unable to contend with the whole strength of the Roman empire, called in Genseric king of the Vandals to his aid; who thereupon abandoned the provinces he had seized in Europe, and passed over into Africa. Bonifacius, however, Africa.

however, being soon after reconciled to his empress Placidia, endeavoured in vain to persuade the Vandals to retire. Hereupon a war ensued, in which the barbarians proved victorious, and quickly over-ran all the Roman provinces in Africa. In the year 435, a peace was concluded; when Numidia and some other countries were ceded to the Vandals, who soon after seized all the rest. These barbarians did not long enjoy their ill-gotten possessions: for, about the year 533, Belisarius drove them out, annexing the provinces to the eastern empire; and in 647, the Saracens, having conquered Mesopotamia, Egypt (which anciently was not included in the meaning of the word *Africa*), Phenicia, Arabia, and Palestine, broke like a torrent into Africa, which they quickly subdued. Their vast empire being in 936 divided into seven kingdoms, the African states retained their independency long after the others were subdued by the Turks: but in the beginning of the 16th century, being afraid of falling under the yoke of Spain, they invited the Turks to their assistance; who first protected, and then inslaved, them. They still continue in a kind of dependence on the Ottoman empire. They are not, however, properly speaking, the *subjects* of the grand Signior, but call him their *protector*, paying him an annual tribute. On the coasts, the natives are almost all addicted to piracy; and with such success have they carried on their employment, that the greatest powers in Europe are become their tributaries, in order to procure liberty to trade on the Mediterranean.

Concerning even those states which are nearest to Europe, very little is known: but the interior nations are scarce known by name; nor do almost any two of the most learned moderns agree in their division of Africa into kingdoms; and the reason is, that scarcely any traveller hath ever penetrated into these inhospitable regions. According to the best accounts, concerning those regions of Africa lying beyond Egypt and Barbary, they are divided in the following manner. On the western coast, to the south of Barbary, lie the kingdoms of Bildulgerid, Zaara, Negroland, Loango, Congo, Angola, Benguela, and Terra de Netal. On the eastern coast beyond Egypt, are those of Nubia, Adal, Ajan, Zanguebar (between these two a huge desart is interposed), Monomatapa, and Sofola. In the interior parts, the kingdoms of Lower Ethiopia, Abex, Monemuge, and Matanan, are made mention of. The southermost part, called Cafraria, is well known for the habitation of the Hottentots.

In many material circumstances, the inhabitants of this extensive continent agree with each other. If we except the people of Abyssinia, who are tawny, and profess a mixture of Christianity, Judaism, and Paganism, they are all of a black complexion. In their religion, except on the sea-coasts, which have been visited and settled by strangers, they are pagans; and the form of government is every where monarchical. Few princes, however, possess a very extensive jurisdiction; for as the natives of this part of Africa are grossly ignorant in all the arts of utility or refinement, they are little acquainted with one another; and generally united in small societies, each governed by its own prince. In Abyssinia, indeed, as well as in Congo, Loango, and Angolo, we are told of powerful monarchs; but on examination, it is found that the authority of these princes stands on a precarious footing, each tribe or separate body of their subjects being under the influence of a petty chieftain of their own, styled *Negus*, to whose commands, however contrary to those of the Negascha Negascht, or king of kings, they are always ready to submit.

The fertility of a country so prodigiously extensive, might be supposed more various than we find it is: in fact, there is no medium in this part of Africa with regard to the advantages of soil; it is either perfectly barren or extremely fertile. This arises from the intense heat of the sun; which, where it meets with sufficient moisture, produces the utmost luxuriancy; and in those countries were there are few rivers, reduces the surface of the earth to a barren sand. Of this sort are the countries of Anian and Zaara; which, for want of water, and consequently of all other necessaries, are reduced to perfect deserts, as the name of the latter denotes. In those countries, on the other hand, where there is plenty of water and particularly where the rivers overflow the land part of the year as in Abyssinia, the productions of nature, both of the animal and vegetable kinds, are found in the highest perfection and greatest abundance. The countries of Mandingo, Ethiopia, Congo, Angola, Batua, Truticui, Monomotapa, Casati, and Mehenemugi, are extremely rich in gold and silver. The baser metals, likewise, are found in these and many other parts of Africa. But the persons of the natives make the most considerable article in the produce and traffic of this miserable quarter of the globe.

On the Guinea or western coast, the English trade to James Fort, and other settlements near and up the river Gambia; where they exchange their woollen and linen manufactures, their hardware, and spirituous liquors, for the persons of the natives. By the treaty of peace in 1783, the river of Senegal, with its dependencies, were given up to France. Gold and ivory, next to the slave trade, form the principal branches of African commerce. These are carried on from the same coast, where the Dutch and French, as well as English have their settlements for this purpose.

The Portuguese are in possession of the east and west coast of Africa, from the Tropic of Capricorn to the Equator; which immense tract they became masters of by their successive attempts and happy discovery and navigation of the Cape of Good Hope. From the coast of Zanguebar, on the eastern side they trade not only for the articles abovementioned, but likewise for several others; as sena, aloes, civet, ambergris, and frankincense. The Dutch have settlements towards the southern part of the continent, in the country called Caffraria, or the land of the Hottentots, particularly Cape Town, which is well settled and fortified; where their ships bound to India usually put in, and trade with the natives for their cattle, in exchange for which they give them spirituous liquors.

The Portuguese being sovereigns of the greatest part of the coast. have a number of black princes their tributaries. There are some independent princes who have extensive dominions; particularly the kings of Dahome and Widah, the most noted of any for the infamous slave trade. Upwards of 200 years have the European nations traded with Africa in human flesh; and encouraged in the Negro countries, wars, rapine,

 desolation,

desolation, and murder, that the West India islands might be supplied with that commodity. The annual exportation of poor creatures from Africa for slaves hath exceeded 100,000; numbers of whom are driven down like sheep, perhaps a 1000 miles from the sea-coast, who are generally inhabitants of villages that have been surrounded in the night by armed force, and carried off to be sold to traders.—Nor do the planters, who purchase them, use any pains to instruct them in religion, to make them amends for the oppression thus exercised upon them. It is said they are unnaturally averse to every thing that tends to it; yet the Portuguese, French, and Spaniards, in their settlements, succeed in their attempts to instruct them, as much to the advantage of the commerce as of religion. It is for the sake of Christianity, and the advantages accompanying it, that English slaves embrace every occasion of deserting to the settlements of these nations.—But upon this subject the feelings and reflection of that nation have of late been abundantly roused, and in the investigation of it the wisdom of the legislator is soon to be employed.

AFRICAN COMPANY, a society of merchants, established by King Charles the II. for trading to Africa; which trade is now laid open to all the subjects, paying 10 *per cent.* for maintaining the forts.

AFRICANUS (Julius), an excellent historian of the third century, the author of a chronicle which was greatly esteemed, and in which he reckons 5500 years from the creation of the world to Julius Cæsar. This work, of which we have now no more than what is to be found in Eusebius, ended at the 221st year of the vulgar æra. Africanus also wrote a letter to Origen on the history of Susanna, which he reckoned supposititious; and we have still a letter of his to Aristides, in which he reconciles the seeming contradictions in the two genealogies of Christ recorded by St Mathew and St Luke.

AFSLAGERS, persons appointed by the burgomasters of Amsterdam to preside over the public sales made in that city. They must always have a clerk of the secretary's office with them, to take an account of the sale. They correspond to our brokers, or auctioneers.

AFT, in the sea language, the same with ABAFT.

AFTERBIRTH, in midwifery, signifies the membranes which surrounded the infant in the womb, generally called the secundines. See MIDWIFERY.

AFTERMATH, in husbandry, signifies the grass which springs or grows up after mowing.

AFTERNOON, the latter half of the artificial day, or that space between noon and night.

AFTER-PAINS, in midwifery, excessive pains felt in the groin, loins, &c. after the woman is delivered.

AFTER-SWARMS, in the management of bees, are those which leave the hive some time after the first has swarmed. See BEE.

AFWESTAD, a large copper-work belonging to the crown of Sweden, which lies on the Dala, in the province of Dalecarlia, in Sweden. It looks like a town, and has its own church. Here they make copper-plates; and have a mint for small silver coin, as well as a royal post-house. W. Long. 14. 10. N. Lat. 58. 10.

AGA, in the turkish language, signifies a great lord or commander. Hence the aga of the Janissaries is the commander in chief of that corps; as the general of horse is denominated *spaheclar aga*. The aga of the Janissaries is an officer of great importance. He is the only person who is allowed to appear before the Grand Signior without his arms across his breast in the posture of a slave. Eunuchs at Constantinople are in possession of most of the principal posts of the seraglio: The title *aga* is given to them all, whether in employment or not. This title is also given to all such men without employ, and especially to wealthy landholders.

We find also *agas* in other countries. The chief officers under the Khan of Tartary are called by this name. And among the Algerines, we read of *agas* chosen from among the *boluk bashis* (the first rank of military officers), and sent to govern in chief the towns and garrisons of that state. The *aga* of Algiers is the president of the divan, or senate. For some years, the *aga* was the supreme officer; and governed the state in the place of bashaw, whose power dwindled to a shadow. But the soldiery rising against the *boluk bashis*, or *agas*, massacred most of them, and transferred the sovereign power to the calif, with the title of *Dey* or King.

AGADES, a kingdom and city of Negroland in Africa. It lies nearly under the tropic of Cancer, between Gubur and Cano. The town stands on a river that falls into the Niger; it is walled, and the king's palace is in the midst of it. The king has a retinue, who serve as a guard. The inhabitants are not so black as other negroes, and consist of merchants and artificers. Those that inhabit the fields are shepherds or herdsmen, whose cottages are made of boughs, and are carried about from place to place on the back of oxen. They are fixed on the spot of ground where they intend to feed their cattle. The houses in the city are stately, and built after the Barbary fashion. This kingdom was, and may be still, tributary to the king of Tombut. It is well watered; and there is great plenty of grass, cattle, senna, and manna. The prevailing religion is the Mahometan, but very loosely professed. N. Lat. 26. 10. E. Long. 9. 10.

AGALLOCHUM. See XYLO ALOES.

AGALMATA, in antiquity, a term originally used to signify any kind of ornaments in a temple; but afterwards for the statues only, as being most conspicuous.

AGAMEMNON, the son of Atreus by Erope, was captain-general of the Trojan expedition. It was foretold to him by Cassandra, that his wife Clytemnestra would be his death: yet he returned to her; and accordingly he was slain by Ægisthus, who had gained upon his wife in his absence, and by her means got the government into his own hands.

AGANIPPIDES, in ancient poetry, a designation given to the muses, from a fountain of mount Helicon, called *Aganippe*.

AGANIPPE, in antiqity, a fountain of Boeotia at mount Helicon, on the borders between Phocis and Boeotia, sacred to the muses, and running into the river Permesseus; (Pliny, Pausanias.) Ovid seems to make *Aganippe* and *Hippocrene* the same. Solinus more truly distinguishes them, and ascribes the blending them to poetical license.

AGAPE, in ecclesiastical history, the love-feast, or feast of charity, in use among the primitive Christians; when

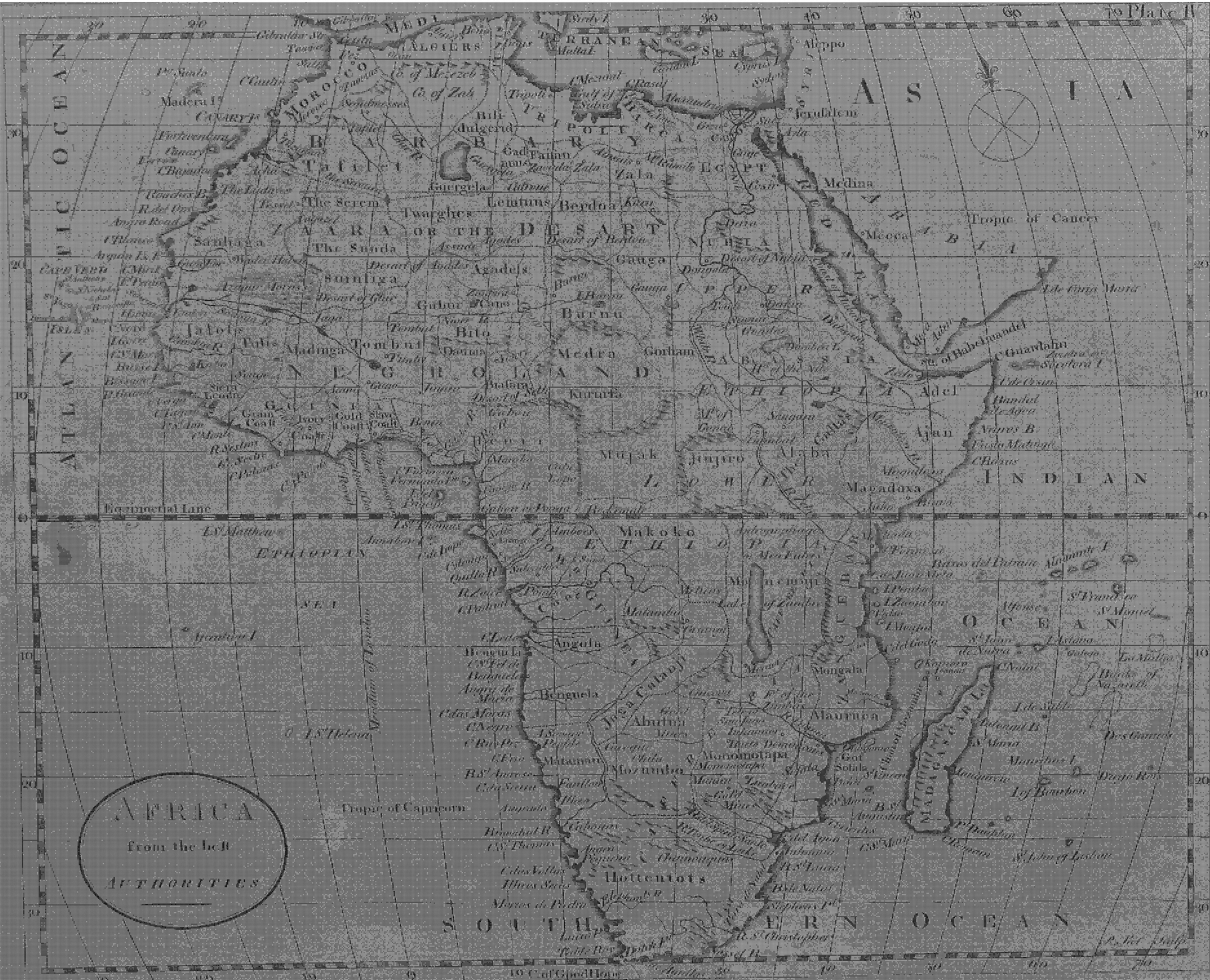


Plate IV
AFRICA
from the best
AUTHORITIES
ATLANTIC OCEAN
MEDITERRANEAN SEA
ASIA
ARABIA
BARBARY
MOROCCO
ALGIERS
TRIPOLI
BARCA
EGYPT
NUBIA
ZAARA OR THE DESART
NEGROLAND
GUINEA
ABYSSINIA
ETHIOPIA
UPPER ETHIOPIA
LOWER ETHIOPIA
ZANGUEBAR
INDIAN OCEAN
ETHIOPIAN SEA
SOUTHERN OCEAN
MADAGASCAR I.
Hottentots
Tropic of Cancer
Tropic of Capricorn
Equinoctial Line
Meridian of London
Jerusalem
Aleppo
Medina
Mecca
Madera I.
Canary I.
Tafilet
Biledulgerid
Twarghes
Lemtuns
Berdoa
Sanhaga
The Sunda
Agadez
Zanfara
Gaoga
Bornu
Tombut
Bito
Medra
Gorham
Kururfa
Mujak
Jagos
Alaba
Adel
Ajan
Magadoxa
Makoko
Monoemugi
Angola
Benguela
Jaga Cassangi
Mongala
Mocaranga
Monomotapa
Sofala
Cape of Good Hope
Straits of Babelmandel
C. Guardafui
Socotora I.
I. St. Helena
Ascension I.
I. St. Matthew
I. of Bourbon
Mauritius I.
Cape Verde Isles

when a liberal contribution was made by the rich to feed the poor. The word is Greek, and signifies *love*. St Crysostom gives the following account of the feast, which he derives from the apostolical practice. He says, "the first Christians had all things in common, as we read in the Acts of the Apostles; but when that equality of possessions ceased, as it did even in the Apostles time, the agape, or love-feast, was substituted in the room of it. Upon certain days, after partaking of the Lord's supper, they met at a common feast; the rich bringing provisions, and the poor who had nothing being invited." It was always attended with receiving the holy sacrament; but there is some difference between the ancient and modern interpreters as to the circumstance of time, viz. Whether this feast was held before or after the communion. St Crysostom is of the latter opinion; the learned Dr Cave of the former. These love-feasts, during the three first centuries, were held in the church without scandal or offence; but, in after times, the heathens began to tax them with impurity. This gave occasion to a reformation of these *agapæ*. The kiss of charity, with which the ceremony used to end, was no longer given between different sexes; and it was expressly forbidden to have any beds or couches, for the conveniency of those who would be disposed to eat more at their ease. Notwithstanding these precautions, the abuses committed in them became so notorious, that the holding of them (in churches at least) was solemnly condemned, at the council of Carthage, in the year 397.

AGAPETÆ, in ecclesiastical history, a name given to certain virgins and widows, who, in the ancient church, associated themselves with, and attended on, ecclesiastics, out of a motive of piety and charity.

In the primitive days there were women instituted DEACONESSES, who, devoting themselves to the service of the church, took up their abode with the ministers, and assisted them in their functions. In the fervour of the primitive piety, there was nothing scandalous in these societies: but they afterwards degenerated into libertinism; insomuch, that St Jerom asks, with indignation, *unde, agapetarum pestis in ecclesias introiit?* This gave occasion to councils to suppress them.—St Athanasius, mentions a priest, named Leontius, who, to remove all occasion of suspicion, offered to mutilate himself, to preserve his beloved companion.

AGARD (Arthur), a learned English antiquarian, born at Toston in Derbyshire in the year 1540. His fondness for English antiquities induced him to make many large collections; and his office as deputy chamberlain of the exchequer, which he held 45 years, gave him great opportunities of acquiring skill in that study. Similarity of taste brought him acquainted with Sir Robert Cotton, and other learned men, who associated themselves under the name of *The Society of Antiquarians*, of which society Mr Agard was a conspicuous member. He made the doomsday-book his peculiar study; and composed a work purposely to explain it, under the title of *Tractatus de usu et obscurioribus verbis libri de Domesday*: he also compiled a book for the service of his successors in office, which he deposited with the officers of the king's receipt, as a proper index for succeeding officers. All the rest of his collections, containing at least twenty volumes, he bequeathed to Sir Robert Cotton; and died in 1615.

AGARIC. See AGARICUS.

Female AGARIC. See BOLETUS.

Mineral AGARIC, a marley earth resembling the vegetable of that name in colour and texture. It is found in the fissures of rocks, and on the roofs of caverns; and is sometimes used as an astringent in fluxes, hemorrhagies, &c.

AGARICUS, or MUSHROOM, a genus of the order of fungi, belonging to the cryptogamia class of plants.

Species and uses. Botanical writers enumerate 55 species belonging to this genus; of which the most remarkable are the following.

1. The campestris, or common mushroom, has the top or cap first of a dirty cream colour, convex, and, if but just expanding, the under part, or what is called the *gills*, is of a bright flesh red: this colour lasts but a little time before it turns darker; and when the plant is old, or has been some time expanded, the gills become of a dark brown, the cap almost flat, of a dirty colour, and often a little scaly. It differs much in size in different plants, it being from an inch to seven inches broad. The general use of it is well known. It is found in woods, old pastures, and by road-sides, and is in the greatest perfection in September. There is a variety of this with a yellowish white cap and white gills; this is very firm, but seldom expands so freely as the true sort, and when broiled will exude a yellowish juice. It is probable this sort is not pernicious, though it is always rejected by such as can distinguish it.

2. The pratensis, or *champignion*, is very common upon heaths and dry pastures. A number of them generally come up in a place, ranged in curved lines or circles. The cap is small, almost flat, from one to two or three inches diameter, of a pale buff colour, often crimpled at the edges, and, when dry, tough like leather or a thin piece of fine cork. The gills are of the colour of the cap; are thinly placed; with a short one, and sometimes two, coming from the edge of the cap between each. The stalk or pillar is also of the colour of the cap; it is long, slender, and all the way of a thickness. This plant has but little smell; is rather dry; and yet, when broiled or stewed, it communicates a good flavour. In perfection at the same time with the former.

3. The chantarellus, or *chantarelle agaric*, is rather a smaller fungus than the former. The cap is yellow, of different hues in different plants, some being of a pale yellow, and others of an orange colour. It is generally sunk in the middle, somewhat resembling a tunnel, and its edges are often twisted and contorted so as to form sinuses or angles. The gills are of a deeper colour than the outside, are very fine, even, numerous, and beautifully branched. The ramifications begin at the stalk, and are variously extended towards the edge of the cap. The pillar is of the same colour as the cap, is seldom inserted in the centre, but rather sideways; it is short, thickish at the root, and the gills mostly run down the top, which make it appear smallest in the middle. This plant broiled with salt and pepper has much the flavour of a roasted cockle; and is esteemed a delicacy by the French, as is the former. It is found in woods and high pastures, and is in perfection about the end of September.

4. The deliciosus, or orange agaric. The general size

 size of the cap of this species is from two to four inches broad. Its form is circular, with the edges bent inwards; convex on the upper surface, except in the centre, where it is a little depressed, so as nearly to resemble the apex of a smooth apple. The colour is a sordid yellow, streaked with ash and yellowish brown, from the centre to the edge, and when it is broken it emits a gold colour juice. The gills are of a deep yellow, and a few of them come out by pairs at the stalk, but divide immediately, and run straight to the edge of the cap. The stalk or pillar is thinnest near the middle, thickest at the root, and when cut transversely, it is quite white in the centre, with a fine yellow ring that goes to the edge. The fungus, well seasoned and then broiled, has the exact flavour of a roasted muscle. Its prime time is September, and it is to be found in high dry woods.

5. The cinnamomeus, or brown mushroom, has a cap the colour of fresh-tanned hides. At first it is hemispherical, firm, even, and fleshy, with mostly a small rising in the centre; but when old it is quite flat. The gills are of a yellowish brown, not very distant from each other, bent like a knee at the pillar, and have a short one or two run from the edge of the cap between each. The pillar is near the length of a finger, firm, rather thick, brown at the base, of a sordid yellow upward, and, when cut transversely, of a fine white grain. The cap in different plants is from two to five inches broad. The whole plant has a pleasant smell, and when broiled gives a good flavour. It is found in woods in September and October.

6. The violaceus, or violet mushroom. Its cap, when first expanded, is smooth, hemispherical, the main surface of a livid colour, but towards the margin it is of a better blue. When full grown or old, it becomes corrugated, and of a rusty brown. The gills of a young plant are of a beautiful violet colour, and regularly placed. The pillar is of the colour of the gills, short, of a conical form, but swelled at the base into a sort of bulb. Its upper part is surrounded with an iron-coloured wool, which, in a plant just expanding, stretches cross to the edge of the cap like a web. This species requires much broiling; but when sufficiently done and seasoned, it is as delicious as an oyster. It is found in woods in October. Hudson's bulbosus is only a variety of this plant.

The above are the only species that can be safely recommended as edible: though there are some other sorts which are frequently eaten by the country people; and it is probable the greatest part of those with firm fleshy caps might be eaten with safety, provided they were chosen from dry grounds. It is well known that soil and situation have a great influence upon the properties of plants; and these being of a singular nature, and absolutely between that of an animal and vegetable, may be more powerfully affected than a complete species of either, by reason they have neither leaves nor branches to carry off the noxious damps and vapours of a stagnant soil, as a perfect vegetable has; nor have they any gross excremental discharges, like those of living animal. The gills no doubt do exhale some of their superfluous moisture; but their situation is such, that any thick steam from the earth may lodge in them, and by clogging their excretory ducts, render the plants morbid. Thus they soon run into a state of putrefaction, and become a prey to worms, flies, and other insects. The common mushroom, which is in general esteem (though we have several others better) is not safely eaten when produced upon a moist soil. Those who gather mushrooms for sale should therefore have particular regard to the lands they collect them from, especially if they know they are to be broiled; but if they be intended for catchup, perhaps they may be less cautious, as the salt and spices with which the juice is boiled may correct any evil disposition in the plants. But, even in this case, catchup made of mushrooms taken from a dry soil has a more aromatic and pleasant flavour than that which is made of those taken from a moist one, and it will always keep a great deal better.

Of the poisonous sorts, the two following are the most singular:

7. The muscarius, or reddish mushroom, has a large hat, almost flat, either white, red, or crimson, sometimes beset with angular red warts; the gills are white, flat, and inversely spear-shaped; the pillar is hollow, the cap fixed to the middle of the pillar, limber, and hanging down. This species grows in pastures, and is said to destroy bugs effectually if the juice is rubbed upon the walls and bed-posts. The inhabitants of the north of Europe, whose houses are greatly infested with flies at the decline of summer, infuse it in milk, and set it in their windows, and the flies upon tasting the least drop are instantly poisoned. An infusion of common pepper in milk answers the same purpose: but the flies through time become wise enough not to taste it; and though vast numbers are at first destroyed, it is impossible to clear a house of these insects by this means.—This is the *moucho-more* of the Russians, Kamtschadales, and Koriacs, who use it as an instrument of intoxication. They sometimes eat it dry, sometimes immersed in a fermented liquor made with the epilobium, which they drink notwithstanding the dreadful effects. They are first seized with convulsions in all their limbs, then with a raving such as attends a burning fever. A thousand phantoms, gay or gloomy (according to their constitutions), present themselves to their imaginations: some dance, others are seized with unspeakable horrors. They personify this mushroon; and, if its effects urge them to suicide, or any dreadful crime, they say they obey its commands. To fit themselves for premiditated assassinations, they take the mouchomore. Such is the fascination of drunkenness, among these people, that nothing can induce them to forbear this dreadful potion!

8. The clypeatos, or long-stalked mushroom, has an hemispherical hat tapering to a point, and clammy; the pillar is long, cylindrical, and white; the gills are white, and not concave, dusted with a fine powdery substance on each side; the root is bulbous, long, and hooked at the end. It is found in September, in woodlands and pastures. This species is thought to be poisonous; and we have the following account of the symptoms produced by eating it, in Dr Percival's Essays. "Robert Usherwood, of Middletown, near Manchester, a strong healthy man, aged 50 years, early in the morning gathered and eat what he supposed to be a mushroom. He felt no symptoms of indisposition, till five o'clock in the evening; when, being very thirsty, he drank near a quart of table-beer. Soon afterwards he became universally swoln, was silk, and in great agonies. A severe vomiting and purging succeeded,

Agaricus. succeeded, with violent cramps in his legs and thighs. He discharged several pieces of the fungus, but with little or no relief. His pains and evacuations continued, almost without intermission, till the next night; when he fell into a sound sleep, and awaked in the morning perfectly easy, and free from complaint."

Many of the different species of this genus grow on cows or horses dung, on dunghills, on rotten wood, in cellars, or on the trunks of trees; of which the most remarkable is,

9. The quercinus, or agaric of the oak. This is of various sizes, sometimes not exceeding the bigness of the fist, sometimes as large as a man's head. It takes at least a year or two to grow to its full size. It is dark coloured, hard, heavy, and woody; it is sometimes used by the dyers, as an ingredient in the black dye. It tastes at first sweetish in the mouth, but presently becomes very bitter and nauseous. It was formerly an article in the Materia Medica; but is now deservedly rejected from our pharmacopœias.

Culture. Only the esculent kinds of mushrooms are cultivated; and the following method is used by the gardeners who raise them for sale.—If the young mushrooms cannot be procured from gardens, they must be looked for in rich pastures during the months of August and September: the ground must be opened about their roots, where it is frequently found full of small white knots; which are the off-sets, or young mushrooms. These must be carefully gathered in lumps, with the earth about them: but as this spawn cannot be found in the pasture, except at that season when the mushrooms are naturally produced, it may be searched for at any time in old dung-hills, especially where there has been much litter, and it hath not been penetrated by wet so as to rot: it may also be found very often in old hot-beds; or it may be procured by mixing some long dung from the stable, which has not been thrown on a heap to ferment, with strong earth, and put under cover to prevent wet getting to it. The spawn commonly appears in about two months after the mixture is made: but proportionably sooner the more effectually the air is excluded, provided the mixture is not kept so close as to heat. Old thatch, or litter which has lain long abroad so as not to ferment, is the best covering. The spawn has the appearanc, of white mould shooting out into long strings, by which it may be easily known wherever it is met with.—The beds for receiving the spawn are now to be prepared. These should be made of dung in which there is plenty of litter, but which should not be thrown on a heap to ferment: that dung which has lain spread abroad for a month or longer is best. The beds should be made on dry ground, and the dung laid on the surface; the width at the bottom should be two and a half or three feet, the length in proportion to the quantity of mushrooms desired; then lay the dung about a foot thick, covering it with strong earth about four inches deep. Upon this lay more dung, about 10 inches thick; then another layer of earth, still drawing in the sides of the bed, so as to form it like the roof of a house; which may be done by three layers of dung, and as many of earth. When the bed is finished, it must be covered with litter or old thatch, both to prevent its drying too fast and to keep out wet. In this situation it ought to remain eight or ten days, when it will be in a proper temperature to receive the spawn; for this is destroyed by too much heat; though, before planting, it may be kept very dry, not only without detriment, but with considerable advantage.—The bed being in a proper temperature for the spawn, the covering of litter should be taken off, and the sides of the bed smoothed; then a covering of light rich earth, about an inch thick, should be laid all over the bed; but this should not be wet. Upon this the spawn must be thrust, laying the lumps two or three inches asunder; then gently cover this with the same light earth, above half an inch thick; and put the covering of litter over the bed, laying it so thick as to keep out wet, and prevent the bed from drying. In spring or autumn the mushrooms will begin to appear, perhaps in a month after making; but when the beds are made in summer or winter, they are much longer before they produce. In any season, however, they ought not to be hastily destroyed; since mushroom-beds have been known to produce very plentifully, even after the spawn has lain in them five or six months. When the beds are destroyed, the spawn should be carefully preserved, and laid up in a dry place, at least five or six weeks before it is again planted.—The difficulty of managing mushroom-beds is, to keep them always in a proper degree of moisture. In the summer season they may be uncovered to receive gentle showers of rain at proper times; and in long dry seasons the beds should now and then be watered, but much wet ought by no means to be suffered to come to them. During the winter season they must be kept as dry as possible, and so closely covered as to keep out cold. In frosty, or very cold weather, if some warm litter, shaken out of a dung-heap, is laid on, the growth of the mushrooms will be promoted: but betwixt this and the bed, a covering of dry litter must be interposed; which should be renewed as it decays; and, as the cold increases, the covering must be thickened. By attending to these directions, plenty of mushrooms may be produced all the year round. One bed will continue good for many months. For a peculiar, perhaps fabulous, method of producing mushrooms, see the article Lyncurius.

Physicians have disputed much about the qualities of mushrooms; some considering them as a rich nourishment, and perfectly innocent, when properly chosen; and others asserting them to be extremely deleterious. Most of the fungi are indeed of a hurtful quality; and, with respect to the whole tribe, the esculent are very few. Esculent mushrooms are very nutritive, very readily alkalescent, and more so without intermediate acescency than any other vegetable: they are therefore a rich nourishment, and much akin to animal food; on which account they may be indulged in considerable quantity to strong persons. It requires, however, skill to distinguish this esculent kind; and very few, especially of those who are commonly employed to gather them, viz. the servants, have studied Clusius, or other authors who have been at the pains to distinguish them. Perhaps esculent mushrooms, if old, acquire a dangerous acrimony; and for these reasons Dr Cullen is of opinion that it is for the most part prudent to avoid them. In the warm climates they may be used as light food; but here it is preposterous to use them along with animal food, as they do not correct its alkaline tendency.

AGATE,

Agate.

ACATE or ACHAT, (among the Greeks and Latins, Αχατης, and *Achates*, from a river in Sicily, on the banks of which it was first found), a very extensive genus of the semipellucid gems.

These stones are variegated with veins and clouds, but have no zones like those of the onyx. They are composed of chrystal debased by a large quantity of earth, and not formed, either by repeated incrustations round a central nucleus, or made up of plates laid evenly on one another; but are merely the effect of one simple concretion, and variegated only by the disposition given, by the fluid they were formed in, to their differently coloured veins or matters.

Agates are arranged according to the different colours of their ground. Of those with a *white* ground there are three species. (1.) The *deudrachates, mocoa stone*, or *aborescent agate*. This seems to be the same with what some authors call the achates with rosemary in the middle, and others achates with little branches of black leaves. (2). The *dull, milky-looking agate*. This, though greatly inferior to the former, is yet a very beautiful stone. It is common on the shores of rivers in the East Indies, and also in Germany and some other parts of Europe. Our lapidaries cut it into counters for card-playing, and other toys of small value. (3.) The *lead-coloured agate*, called the *phassachates* by the ancients.

Of the agates with a *reddish* ground there are four species. (1.) An impure one of a flesh-coloured white, which is but of little beauty in comparison with other agates. The admixture of flesh-colour is but very slight; and it is often found without any clouds, veins, or other variegations; but sometimes it is prettily veined or variegated with spots of irregular figures, having fimbriated edges. It is found in Germany, Italy, and some other parts of Europe; and is wrought into toys of small value, and often into the German gunflints. It has been some times found with evident specimens of the perfect mosses bedded deep in it. (2.) That of a pure blood colour, called *hæmachates*, or the *bloody agate*, by the ancients. (3.) The clouded and spotted agate, of a pale flesh colour, called by the ancients the *carnelian agate*, or *sardachates*. 4. The red-lead coloured one, variegated with yellow, called the *coral agate*, or *coralla-achates*, by the ancients.

Of the agates with a *yellowish* ground there are only two known species; the one of the colour of yellow wax, called *cerachates* by the ancients; the other a very elegant stone, of a yellow ground, variegated with white, black, and green, called the *leonina*, and *leonterseres* by the ancients.

Lastly, Of the agates with a *greenish* ground, there is only one known species, called by the ancients *jaspachates*.

Of all these species there are a great many varieties; some of them having upon them natural representations of men and different kinds of animals, &c. These representations are not confined to the agates whose ground is of any particular colour, but are occasionally found on all the different species. Velchius had in his custody a flesh-coloured agate, on one side of which appeared a half-moon in great perfection, represented by a milky semicircle; on the other side, the phases of *vesper*, or the evening-star; whence he denominated it an *aphrodisian agate*. An agate is mentioned by Kircher *, on which was the representation of a heroine armed; and one in the church of St Mark in Venice has the representation of a king's head adorned with a diadem. On another, in the musæum of the prince of Gonzaga, was represented the body of a man with all his clothes in a running posture. A still more curious one is mentioned by de Boot †, wherein appears a circle struck in brown, as exactly as if done with a pair of compasses, and in the middle of the circle the exact figure of a bishop with a mitre on: but inverting the stone a little, another figure appears; and if it is turned yet further, two others appear, the one of a man, and the other of a woman. But the most celebrated agate of this kind is that of Pyrrhus, wherein were represented the nine muses, each with their proper attributes, and Apollo in the middle playing on the harp ‡. In the emperor's cabinet is an oriental agate of a surprising bigness, being fashioned into a cup, whose diameter is an ell, abating two inches. In the cavity is found delineated in black specks, B. XRISTOR. S. XXX. Other agates have also been found, representing the numbers 4191, 181: whence they were called *arithmetical* agates, as those representing men or women have obtained the name of *anthropomorphous*.

* Ephem. German. dec. i. an. I. obs. 151.

† De Gem. l. ii. c. 95.

‡ Pliny, l. xxxvii. c. 3.

Great medicinal virtues were formerly attributed to the agate, such as resisting poisons, especially those of the viper, scorpion, and spider; but they are now very justly rejected from medicinal practice. The oriental ones are all said to be brought from the river Gambay. A mine of agates was some time ago discovered in Transylvania, of divers colours; and some of a large size, weighing several pounds.

Agates may be stained artificially with solution of silver in spirit of nitre, and afterwards exposing the part to the sun; and though these artificial colours disappear on laying the stone for a night in aquafortis, yet a knowledge of the practicability of thus staining agates, must render those curious figures abovementioned strongly suspected of being the work not of nature, but of art. Some account for these phenomena from natural causes. Thus, Kircher, who had seen a stone of this kind in which were depicted the four letters usually incribed on crucifixes, I. N. R. I. apprehends that some real crucifix had been buried under-ground, among stones and other rubbish, where the inscription happening to be parted from the cross, and to be received among a soft mould or clay susceptible of the impression of the letters. came afterwards to be petrified. In the same manner he supposes the agate of Pyrrhus to have been formed. Others resolve much of the wonder into fancy, and suppose those stones formed in the same manner with the *Camieux* * or Florentine stones.

* See *Camieux*.

The agate is used for making cups, rings, seals, handles for knives and forks, hilts for swords and hangers, beads to pray with, smelling boxes, patch-boxes, &c. being cut or sawed with no great difficulty. At Paris, none have a right to deal in this commodity except the wholesale mercers and goldsmiths. The sword-cutlers are allowed to sell it, but only when made into handles for couteaux de chasse, and ready to set in. The cutlers have the same privilege for their knives and forks.

Considerable quantities of these stones are still found near the river Achates in Sicily. There are found in some of these the surprising representations abovemenmentioned, or others similar to them. By a dexterous management of these natural stains, medals have been produced, which seem master-pieces of nature: for this stone bears the graver well; and as pieces of all magnitudes are found of it, they make all sorts of work of it. The high altar of the cathedral of Messina is all over encrusted with it. The lapidaries pretend that the Indian agates are finer than the Sicilian; but Father Labat* informs us, that in the same quarries, and even in the same block, there are found pieces much finer than others, and these fine pieces are sold for Indian agates in order to enhance their price.

* Voyage d'Ital. tom. v. p. 156.

AGATE, among antiquaries, denotes a stone of this kind engraven by art. In this sense, agates make a species of antique gems; in the workmanship whereof we find eminent proofs of the great skill and dexterity of the sculptors. Several agates of exquisite beauty are preserved in the cabinets of the curious; but the facts or histories represented on these antique agates, however well executed, are now become so obscure, and their explications so difficult, that several diverting mistakes and disputes have arisen among those who undertook to give their true meaning.

The great agate of the apotheosis of Augustus, in the treasury of the holy chapel, when sent from Constantinople to St Lewis, passed for a triumph of Joseph. An agate, now in the French king's cabinet, had been kept 700 years with great devotion, in the Benedictine abbey of St Evre at Toul, where it passed for St John the Evangelist carried away by an eagle, and crowned by an angel; but the Heathenism of it having been lately detected, the religious would no longer give it a place among their relicts, but presented it in 1684 to the king. The antiquaries found it to be the apotheosis of Germanicus. In like manner the triumph of Joseph was found to be a representation of Germanicus and Agrippina, under the figures of Ceres and Triptolemus. Another was preserved, from time immemorial, in one of the most ancient churches of France, where it had passed for a representation of paradise and the fall of man; there being found on it two figures representing Adam and Eve, with a tree, a serpent, and a Hebrew inscription round it, taken from the third chapter of Genesis, "The woman saw that the tree was good," &c. The French academists, instead of our first parents, found Jupiter and Minerva represented by the two figures: the inscription was of a modern date, written in a Rabbinical character, very incorrect, and poorly engraven. The prevailing opinion was, that this agate represented simply the worship of Jupiter and Minerva at Athens.

Hist. Acad. R. Inscript. tom. i. p. 337,—344.

AGATE, is also a name of an instrument used by goldwire-drawers; so called from the agate in the middle of it, which forms its principal part.

AGATHIAS, or, as he calls himself in his epigrams, AGATHIUS, distinguished by the title of *Scholasticus*, a Greek historian in the 6th century under Justinian. He was born at Myrina, a colony of the ancient Æolians, in Asia the less, at the mouth of the river Phythicus. He was an advocate at Smyrna. Tho' he had a taste for poetry, he was yet more famous for his history, which begins with the 26th year of Justinian's reign, where Procopius ends. It was printed in Greek and Latin, with Bonaventure Vulcanius's, at Leyden, 1594, in 4to; and in Paris at the king's printing-house, 1660, in folio.

AGATHO, a tragic and comic poet, disciple to Prodicus and Socrates, applauded in Plato's Dialogues for his virtue and beauty. His first tragedy obtained the prize; and he was crowned in the presence of upwards of 30,000 men, the 4th year of the 90th Olympiad. There is nothing now extant of his, except a few quotations in Aristotle, Athenæus, and others.

AGATHOCLES, the famous tyrant of Sicily, was son of a potter at Reggio. He was a thief, a common soldier, a centurion, a general, and a pirate, all in a regular succession. He defeated the Carthaginians several times in Sicily, and was once defeated himself. He first made himself tyrant of Syracuse, and then of all Sicily; after which, he vanquished the Carthaginians again both in Sicily and Africa. But at length having ill success, and being in arrears with his soldiers, they mutinied, forced him to fly his camp, and cut the throats of his children, whom he left behind. Recovering himself again, he relieved Corfou, besieged by Cassander; burnt the Macedonian fleet; returned to Sicily; murdered the wives and children of those who had murdered his; afterwards meeting with the soldiers themselves, he put them all to the sword; and ravaging the sea-coast of Italy, took the city of Hipponium. He was at length poisoned by his grandson Archagathus, in the 72d year of his age, 290 years before Christ, having reigned 28 years.

AGATHYRNA, or AGATHYRNUM, AGATHYRSA, or AGATHYRSUM, (anc. geog.), a town of Sicily; now *S. Marco*; as old as the war of Troy, being built by Agathyrnus, son of Æolus, on an eminence. The gentilitious name is *Agathyrnæus*; or, according to the Roman idiom, *Agathyrnensis*.

AGAVE, the common American aloe: A genus of the monogynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 10th order, *Coronariæ*. The characters are: There is no *calyx*: The *corolla* is monopetalous and funnel-shaped; the border six-parted, with lanced erect divisions: The *stamina* consist of six erect filaments, longer than the corolla; the antheræ are linear, shorter than the filaments, and versatile: The *pistillum* is an oblong germen; the stylus is filiform, the length of the stamina, and triangular; the stigma headed and triangular: The *pericarpium* is an oblong triangular capsule, trilocular and three-valved: The *seeds* are numerous. Of this genus, botanical writers enumerate eight species.

Of the Americana, or great American aloe, the stems generally rise upwards of 20 feet high, and branch out on every side towards the top, so as to form a kind of pyramid: the slender shoots being garnished with greenish yellow flowers, which stand erect, and come out in thick clusters at every joint: these make a fine appearance, and continue long in beauty; a succession of new flowers being produced for near three months in favourable seasons, if the plant is protected from the autumnal colds. The seeds do not ripen in England. It has been generally thought, that these plants do not flower till they are 100 years old: but this is a mistake; for the time of their flowering depends on their growth: so that in hot countries, where they grow fast,

fast, and expand many leaves every season, they will flower in a few years; but in colder climates, where ther growth is slow, it will be much longer before they shoot up their stem. There is a variety of this species with striped leaves, which are pretty common in the English gardens. The other sorts are so tender, that they must constantly remain in the stove.

ADGE, a city of France, in Lower Languedoc, in the territory of Agadez, with a bishop's see. The diocese is small, but is one of the richest countries in the kingdom. It produces fine wool, wine, oil, corn, and silk. It is seated on the river Eraut, a mile and a quarter from its mouth, where it falls into the gulph of Lyons, and where there is a fort built to guard its entrance. It is well peopled; the houses are built of black stone, and there is an entrance into the city by four gates. The greatest part of the inhabitants are merchants or seamen. The public buildings are but mean: the cathedral is small, and not very handsome: the bishop's palace is an old building, but convenient. The city is extended along the river, where it forms a little port, wherein small craft may enter. There is a great concourse of pilgrims and other devout people to the chapel of Notre Dame de Grace It is a little without the city, between which and the chapel there are about 13 or 14 oratories, which they visit with naked feet. The convent of the Capuchins is well built, and on the outside are lodgings and apartments for the pilgrims who come to perform their *neuvaine* or nine days devotion. The chapel, which contains the image of the Virgin Mary, is distinct from the covent. E. Long. 3. 20. Lat. 43. 19.

AGE, in the most general sense of the word, signifies the duration of any being, from its first coming into existence to the time of speaking of it, if it still continues; or to its destruction, if it has ceased to exist some time before we happen to mention it.

Among the ancient poets, this word was used for the space of thirty years; in which sense, *age* amounts to much the same with *generation*. Thus, Nestor is said to have lived *three ages* when he was 90 years old.—By ancient Greek historians, the time elapsed since the beginning of the world is divided into three periods, which they called *ages*. The first reaches from the creation to the deluge which happened in Greece during the reign of Ogyges; this they called the *obscure* or *uncertain* age, because the history of mankind is altogether uncertain during that period. The second they call the *fabulous* or *heroic* age, because it is the period in which the fabulous exploits of their gods and heroes are said to have been performed. It began with the Ogygian deluge, and continued to the first Olympiad; where the third or *historical* age commenced.—This division, however, it must be observed, holds good only with regard to the Greeks and Romans, who had no histories earlier than the first Olympiad; the Jews, Egyptians, Phenicians, and Chaldees, not to mention the Indians and Chinese, who pretend to much higher antiquity, are not included in it.

The interval since the first formation of man has been divided by the poets into four *ages*, distinguished by the epithets of *golden*, *silver*, *brazen*, and *iron*. During the *golden* age, Saturn reigned in heaven, and justice and innocence in this lower world. The earth then yielded her productions without culture; men held all things in common, and lived in perfect friendship. This period is supposed to have lasted till the expulsion of Saturn from his kingdom. The *silver* age commenced when men began to deviate from the paths of virtue; and in consequence of this deviation, their lives became less happy. The *brazen* age commenced on a farther deviation, and the *iron* age took place in consequence of one still greater.—A late author, however, reflecting on the barbarism of the first ages, will have the order which the poets assign to the four ages inverted; the first being a time of rudeness and ignorance, more properly denominated an *iron* than a *golden* age. When cities and states were founded, the *silver* age commenced; and since arts and sciences, navigation and commerce, have been cultivated, the *golden* age has taken place.

In some ancient northern monuments, the *rocky* or *stony* age corresponds to the *brazen* age of the Greeks. It is called *rocky*, on account of Noah's ark, which rested on mount Ararat; whence men were said to be descended or sprung from mountains: or from Deucalion and Pyrrha restoring the race of mankind, by throwing stones over their heads. The northern poets also style the fourth age of the world the *ashen* age, from a Gothic king Madenis, or Mannus, who on account of his great strength was said to be made of ash, or because in his time people began to make use of weapons made of that wood.

Among the Jews, the duration of the world is also divided into three ages. 1. The *seculum inane*, or *void age*, was the space of time from the creation to Moses. 2. The *present* age, denotes all the space of time from Moses to the coming of the Messiah; and, 3. The *age to come*, denotes the time from the coming of the Messiah to the end of the world.

Various other divisions of the duration of the world into *ages* have been made by historians—The Sibylline oracles, wrote, according to some, by Jews acquainted with the prophecies of the Old Testament, divide the duration of the world into ten *ages*; and according to Josephus, each age contained six hundred years. It appears, by Virgil's fourth eclogue, and other testimonies, that the age of Augustus was reputed the end of those ten *ages*, consequently as the period of the world's duration.

By some, the space of time commencing from Constantine, and ending with the taking of Constantinople by the Turks in the 15th century, is called the *middle age*: but others choose rather to date the middle age from the division of the empire made by Theodosius at the close of the 4th century, and extend it to the time of the emperor Maximilian I. in the beginning of the 16th century, when the empire was first divided into circle.—The *middle* is by some denoted the *barbarous* age, and the latter part of it the *lowest* age. Some divide it into the *non-academical* and *academical* ages. The first includes the space of time from the 6th to the 9th centuries, during which schools or academies were lost in Europe. The second from the 9th century, when schools were restored, and universities established, chiefly by the care of Charlemagne.

The several *ages* of the world may be reduced to three grand epochas, *viz.* the *age* of the law of nature, called by by the Jews the *void age*, from Adam to Moses; the *age* of the Jewish law, from Moses to Christ; and the *age* of grace, from Christ to the present year.

Age is also frequently used in the same sense with *century*, to denominate a duration of 100 years.

Age likewise signifies a certain period of the duration of human life, by some divided into four stages, namely, infancy, youth, manhood, and old age; the first extending to the 14th year, the second to the 25th, the third to the 50th, and the fourth to the end of life; by others divided into infancy, childhood, youth, manhood, and old age.

Age, in law, signifies a certain period of life, when persons of both sexes are enabled to do certains acts. Thus, one at twelve years of age ought to take the oath of allegiance to the king in a leet; at fourteen he may marry, chuse his guardian, and claim his lands held in soccage. Twenty-one is called *full age*, a man or woman being then capable of acting for themselves, of managing their affairs, making contracts, disposing of their estates, and the like.

Age of a Horse. See Horse.

Age of Trees, These after a certain age waste. An oak at an hundred years old ceases to grow. The usual rule for judging of the *age* of wood, is by the number of circles which appear in the substance of a trunk or stock cut perpendicularly, each circle being supposed the growth of a year: though some reject this method as precarious, alledging that a simple circle is sometimes the produce of several years: besides, that, after a certain age, no new circles are formed.

Age-prier, in law, is when an action being brought against a person under age, for lands descended to him, he, by motion or petition, shews the matter to the court, praying the action may be staid till his full age, which the court generally agrees to.

AGELNOTH, Egelnoth, or Æthelnoth, in Latin *Achelnotus*, archbishop of Canterbury, in the reign of Canute the Great, succeeded Livingus in that see in the year 1020. This prelate sirnamed the *Good*, was the the son of Agilmer, and, at the time of his election, dean of Canterbury. After his promotion he went to Rome, and received his pall from Pope Benedict VIII. In his way thither, as he passed through Pavia, he purchased, for an hundred talents of silver and one of gold, St Augustin's arm, which was kept there as a relic; and sent it over to England as a present to Leofric earl of Coventry. Upon his return, he is said to have raised the see of Canterbury to its former lustre. He was much in favour with king Canute, and employed his interest with that monarch to good purposes. It was by his advice the king sent over large sums of money for the support of the foreign churches; and Malmsbury observes, that this prince was prompted to acts of piety, and restrained from excesses, by the regard he had for the archbishop. Agelnoth, after he had sat 17 years in the see of Canterbury, departed this life the 29th of October, 1038, and was succeeded by Eadsius, king Harold's chaplain.—This archbishop was an author, having written, 1. A Panegyric on the blessed Virgin Mary. 2. A Letter to Earl Leofric concerning St Augustin. 3. Letters to several persons.

AGEMA, in Macedonian antiquity, was a body of soldiery, not unlike the Roman legion.

AGEMOGLANS, Agiamoglans, or Azamoglans, in the Turkish polity, are children purchased from the Tartars, or raised every third year, by way of tribute, from the Christians tolerated in the Turkish empire. These, after being circumcised and instructed in the religion and language of their tyrannical masters, are learnt the exercises of war, till they are of a proper age for carrying arms; and from this corps the Janissaries are recruited. With regard to those who are thought unfit for the army, they are employed in the lowest offices of the seraglio. Their appointments also are very small, not exceeding seven aspers and a half per day, which amount to about threepence-halfpenny Sterling.

AGEN, a city of France, on the river Garonne, the capital of Agenois in Guienne, and the see of a bishop. The gates and old walls, which are yet remaining, show that this city is very ancient, and that its former circuit was not so great as the present. The palace, wherein the presidial holds his sessions at this day, was heretofore called the castle of Montravel, and is seated without the walls of the old city, and on the side of the fosse. There are likewise the ruins of another castle called *La Sagne*, which was without the walls close by a brook. Though the situation of Agen is very convenient for trade and commerce, the inhabitants are so very indolent that there is very little; of which the neighbouring cities take the advantage. It is seated on the bank of the river Garonne, in a pleasant country: but is itself a very mean and disagreeable place, the houses being ill built, and the streets narrow, crooked, and dirty. E. Long. 0. 30. N. Lat. 44. 12.

AGENDA, among philosophers and divines, signifies the duties which a man lies under an obligation to perform: thus, we meet with the *agenda* of a Christian, or the duties he ought to perform, in opposition to the *credenda*, or things he is to believe.

Agenda, among merchants, a term sometimes used for a memorandum-book, in which is set down all the business to be transacted during the day, either at home or abroad.

Agenda, among ecclesiastical writers denote the service or office of the church. We met with *agenda matutina & vespertina*, "morning and evening prayers;" *agenda diei*, "the office of the day," whether feast or fast day; *agenda mortuorum*, called also simply *agenda*, "the service of the dead."

Agenda is also applied to certain church-books, compiled by public authority, prescribing the order and manner to be observed by the ministers and people in the principal ceremonies and devotions of the church. In which sense, *agenda* amounts to the same with what is otherwise called *ritual*, *liturgy*, *acalouthia*, *missal*, *formulary*, *directory*, &c.

AGENHINE, in old writers, signifies a guest that has lodged at an inn for three nights, after which time he was accounted one of the family; and if he offended the king's peace, his host was answerable for him. It is also written hogenhine and hogenhyne.

AGENORIA, in mythology, the gooddess of courage and industry, as *Vacuna* was of indolence.

AGENT, in a general sense, denotes any active power or cause. Agents are either natural or moral. Natural agents are such inanimate bodies as have a

 power

power to act upon other bodies in a certain and determinate manner; as, gravity, fire, &c. Moral agents, on the contrary, are rational creatures, capable of regulating their actions by a certain rule.

Agent, is also used to denote a person intrusted with the management of an affair, whether belonging to a society, company, or private person.

Agentes in rebus, one of the ranks of officers in the court of the Constantinopolitan emperors, whose business was to collect and convey the corn both for the army and household; to carry letters and messages from court to all parts of the empire; to regulate couriers, and their vehicles; to make frequent journeys and expeditions through the provinces, in order to inspect any motions, disturbances, or machinations tending that way, and to give early notice thereof to the emperor.

The *agentes in rebus*, are by some made synonymous with our post-masters, but their functions were of great extent. They correspond to what the Greeks call αγγαροφοροι, and the Latins *veredarii*.

There were various orders or degrees of *agentes in rebus*; as, *tribuni*, *primicerii*, *senatores*, *ducenarii*, *biarchi*, *circitores*, *equites*, *tyrones*, &c. through all which they rose *gradatim*. Their chief, who resided at Constantinople, was denominated *princeps*; which was a post of great dignity, being reckoned on a level with that of proconsul. They were settled in every part of the empire; and are also said to have served as interpreters.

AGER, in Roman antiquity, a certain portion of land allowed to each citizen. See Agrarian Law.

AGER picinus, or *Picenum*, (anc. geog.) a territory of Italy to the south-east of Umbria, reaching from the Apennine to the Adriatic. The people are called *Picentes* (Cicero, Livy), distinct from the Picentini on the Tuscan sea, though called by Greek writers Πικεντινοι. This name is said to be from the bird *Picus*, under whose conduct they removed from the Sabines, of whom they were a colony.

AGERATUM, bastard-hemp-agrimony: A genus of the polygamia æqualis order, belonging to the syngenesia class of plants: and in the natural method ranking under the 49th order, *Compositæ discoides*. The characters are: The common *calyx* is oblong, with many scales. The compound *corolla* is uniform; the corollets hermaphrodite, tubular and numerous: the proper corolla is funnel-shaped; the border 4-cleft, and expanded. The *stamina* consist of 5 capillary very short filaments; the anthera is cylindric and tubular. The *pistillum* is an oblong germen; with a filiform stylus, and two slender erect stigmata. There is no *pericarpium*; the *calyx* unchanged. The *seeds* are solitary, oblong, and angular. The *receptaculum* is naked, convex, and very small. Of this genus there are three

Species; the conyzoides, the houstonianum, and the altissimum. All these are natives of warm climates. The two first are annual plants, and consequently can be propagated only by seeds; which, however, come to perfection in England. The third species will bear the severest cold of Britain, but its seeds do not ripen in it.

Ageratum, or Maudlin. See Achillæ.

AGESILAUS, king of the Lacedæmonians, the son of Archidamus, was raised to the throne notwithstanding the superior claim of Leotychides. As soon as he came to the throne, he advised the Lacedæmonians to be beforehand with the king of Persia, who was making great preparations for war, and to attack him in his own dominions. He was himself chosen for this expedition; and gained so many advantages over the enemy, that if the league which the Athenians and the Thebans formed against the Lacedæmonians had not obliged him to return home, he would have carried his victorious arms into the very heart of the Persian empire. He gave up, however, all these triumphs readily, to come to the succour of his country, which he happily relieved by his victory over the allies in Bœotia. He obtained another near Corinth; but to his great mortification, the Thebans afterwards gained several over the Lacedæmonians. These misfortunes at first raised somewhat of a clamour against him. He had been sick during the first advantages which the enemy gained; but as soon as he was able to act in person, by his valour and prudence he prevented the Thebans from reaping the advantages of their victories; insomuch that it was generally believed, had he been in health at the beginning, the Lacedæmonians would have sustained no losses, and that all would have been lost had it not been for his assistance. It cannot be denied but he loved war more than the interest of his country required; for if he could have lived in peace, he had saved the Lacedæmonians several losses, and they would not have been engaged in many enterprises which in the end contributed much to weaken their power. He died in the third year of the 104th Olympiad, being in the 83th year of his age, and 41st year of his reign. Agesilaus would never suffer any picture or sculpture to be made of him, and prohibited it also by his will: this he is supposed to have done from a consciousness of his own deformity; for he was of a short stature, and lame of one foot, so that strangers used to despise him at the first sight. His fame went before him into Egypt, and there they had formed the highest idea of Agesilaus. When he landed in that country, the people ran in crouds to see him; but great was their suprise when they saw an ill-dressed, slovenly mean-looking little fellow lying upon the grass; they could not forbear laughing, and applied to him the fable of the mountain in labour. He was, however, the first to jest upon his own person; and such was the gaiety of his temper, and the strength with which he bore the roughest exercises, that these qualities made amends for his corporal defects. He was extremely remarkable for plainness and frugality of his dress and way of living. "This (says Cornelius Nepos) is especially to be admired in Agesilaus: when very great presents were sent him by kings, governors, and states, he never brought any of them to his own house; he changed nothing of the diet, nothing of the apparel of the Lacedæmonians. He was contented with the same house in which Euristhenes the founder of his family had lived; and whoever entered there, could see no sign of debauchery, none of luxury; but on the contrary, many of moderation and abstinence; for it was furnished in such a manner, that it differed in nothing from that of any poor or private person." Upon his arrival in Egypt, all kind of provisions were sent to him; but he chose only the most common, leaving the perfumes, the confections, and all that was esteemed most delicious, to his servants. Agesilaus was extremely fond of his children, and would often amuse himself by

joining

joining in their diversions: one day when he was surprised riding upon a stick with them, he said to the person who had seen in him in this posture, "Forbear talking of it till you are a father."

AGGA, or AGGONNA, a British settlement on the gold-coast of Guinea. It is situated under the meridian of London, in 6 degrees of N. Lat.

AGGER, in the ancient military art, a work of fortification, used both for the defence and the attack of towns, camps, &c. In which sense it is the same with what was otherwise called *vallum*, and in later times *aggestum*; and among the moderns *lines*, sometimes *cavaliers*, *terrasses* &c. The agger was usually a bank, or elevation of earth or other matter, bound and supported with timber; having sometimes turrets on the top, wherein the workmen, engineers, and soldiery, were placed. It was also accompanied with a ditch, which served as its chief defence. The usual materials of which it was made were earth, boughs, fascines, stakes, and even trunks of trees, ropes, &c. variously crossed, and interwoven somewhat in the figure of stars; whence they were called *stellati axes*. Where these were wanting, stones, bricks, tiles, supplied the office: on some occasions, arms, utensils, pack-saddles, were thrown in to fill it up. We even read of aggers formed of the carcases of the slain; sometimes of dead bones mixed with lime; and even with the heads of slaughtered citizens. For want of due binding, or solid materials, aggers have sometimes tumbled down, with infinite mischief to the men. The besiegers used to carry on a work of this kind nearer and nearer towards the place, till at length they reached the very wall. The methods taken, on the other side, to defeat them, were by fire, especially if the agger were of wood; by sapping and undermining, if of earth; and, in some cases, by erecting a counter agger.

The height of the agger was frequently equal to that of the wall of the place. Cæsar tells us of one he made, that was 30 feet high and 330 feet broad. Besides the use of aggers before towns, the generals used to fortify their camps with such works; for want of this precaution, armies have often been surprised and ruined.

There were vast aggers made in towns and places on the sea-side, fortified with towers, castles, &c. Those made by Cæsar and Pompey at Brundusium, are famous. Sometimes aggers were even built across arms of the sea, lakes, and morasses; as was done by Alexder before Tyre, and by M. Anthony and Cassius.—The wall of Severus, in the north of England, may be considered as a grand agger, to which belong several lesser ones. See SEVERUS's *Wall*.

AGGER, in ancient writers, likewise denotes the middle part of a military road, raised into a ridge, with a gentle slope on either side, to make a drain for the water, and keep the way dry.

The term is also used for the whole road, or military way. Where highways were to be made in low grounds, as between two hills, the Romans used to raise them above the adjacent land, so as to make them on a level with the hills. These banks they called *aggeres*. Bergier mentions several in Gallia Belgica, which were thus raised ten, fifteen, or twenty feet above ground.—They are sometimes also called *aggeres calceati*; and now generally known by the name *chaussees*, or *causeways*.

AGGERHUYS, a city of Norway, capital of the province of the same name. It is subject to Denmark, and situated in E. Long. 28. 35. and N. Lat. 59. 30.

AGGERS-HERRED, a district of Christiansand, and a diocese of Norway. It consists of three juridical places; namely, Ascher, West Barum, and Ager.

AGGLUTINANTS, in pharmacy, a general name for all medicines of a glutinous or viscid nature; which, by adhering to the solids, contribute greatly to repair their loss.

AGGLUTINATION, in a general sense, denotes the joining two or more things together, by means of a proper glue or cement.

AGGLUTINATION, among physicians, implies the action of reuniting the parts of a body, separated by a wound, cut, &c. It is also applied to the action of such internal medicines as are of an agglutinating quality, and which, by giving a glutinous consistence to the animal-fluids, render them more proper for nourishing the body.

AGGREGATE, in a general sense, denotes the sum of several things added together, or the collection of them into one whole. Thus, a house is an aggregate of stones, wood, mortar, &c. It differs from a mixed or compound, inasmuch as the union of these last is more intimate than between the parts of an aggregate.

AGGREGATE, in botany, is a term used to express those flowers, which are composed of parts or florets, so united by means either of the receptacle or calyx, that no one of them can be taken away without destroying the form of the whole. They are opposed to simple flowers, which have no such common part, and are usually divided into seven kinds, viz. the *aggregate*, properly so called, whose receptacle is dilated, and whose florets are supported by foot-stalks; such are the blue daisy, thrift, or sea-pink, &c.; the *compound*; the *umbellati*; the *cymose*; the *amentaceous*; the *glumose*; and the *spadiceous*.

AGGREGATION, in physics, a species of union whereby several things which have no natural dependence or connection with one another are collected together, so as in some sense to constitute one. Thus, a heap of sand, or a mass of ruins, are bodies by aggregation.

AGHER, a town of Ireland, which sends two members to parliament. It is situated in the southern part of Ulster, not far from Clogher.

AGHRIM, a town of Ireland, in the county of Wicklow, and province of Leinster, situated about 13 miles south west of Wicklow.

AGHRIM, in Galway; a small village, distant about 21 miles from Dublin, and rendered memorable by a decisive battle fought there, and at Kilcommodon-hill, the 12th of July 1691, between general Ginckle and Monsieur St Ruth, the commanders under king William III. and James II, when St Ruth, the general of the Irish army, with 7000 of his men, were slain; but of the English only 600. The victory was the more considerable, as the English army consisted of no more than 18,000 men; whereas the Irish were computed at 20,000 foot and 5000 horse and dragoons. They lost likewise nine pieces of brass cannon; all their ammunition, tents and baggage; most of their small arms, which they threw away to expedite their flight; with 11 standards, and 52 pair of colours.

AGIADES, in the Turkish armies, a kind of pioneers employed in fortifying camps, smoothing of roads, and the like offices.

AGILITY, an aptitude of the several parts of the body to motion.—The improving of agility was one of the chief objects of the institution of games and exercises. The athletæ made particular profession of the science of cultivating and improving agility. Agility of body is often supposed peculiar to some people; yet it seems less owing to any thing peculiar in their frame and structure, than to practice.

AGINCOURT, a village of the French Netherlands, situated in E. Long. 2. 10. N. Lat. 50. 35; famous on account of the victory obtained by Henry V. of England over the French, in 1415.

The army of Henry, after landing in France, was by various accidents reduced to 10,000 men, of whom not a few were sick, or slowly recovering from sickness;—they had to traverse a long tract of country, inhabited by exasperated enemies, from whom they were to procure provisions, lodgings, guides, intelligence, and every thing they wanted;—that country was defended by many strong towns, intersected by deep rivers, and guarded by an army of 100,000, or (according to some contemporary writers) 140,000 men.

Henry, undaunted by all these dangers and difficulties, departed from Harfleur, marching his army in three lines, with bodies of cavalry on the wings. He proceeded by very easy journeys, that he might not fatigue his troops, or discourage them by the appearance of a flight; observing the strictest discipline, and paying generously for every thing he received; which induced the country people to bring provisions to his camp, in spite of all the commands they had received to the contrary. To keep his men in spirits, and from repining, the king fared as ill as the meanest soldier, always appearing with a chearful countenance, and addressing them in the most friendly and encouraging language. They arrived at the village of Agincourt, in the county of St Pol, on the evening of October 24th; and there beheld the whole French army, at a small distance, directly in their route. The king took an attentive view of it from an eminence; and being fully convinced that it was impossible to proceed any further on his way to Calais without a battle, and equally impossible to return to Harfleur with so great an army in his rear, he resolved to hazard an action next morning, as the only means of preserving himself and his little army from destruction.

The English army lodged that night in the villages of Agincourt, Maisoncelle, and some others; where they met with better accommodation than they had been accustomed to for some time past, and spent part of their time in mutual exhortations to fight bravely in the approaching battle. The king, overhearing some of his nobles expressing a wish that the many brave men who were idle in England were present to assist them, is said to have cried out—"No! I would not have one man more:—if we are defeated, we are too many—if it shall please God to give us the victory, as I trust he will, the smaller our number the greater our glory." The moon happening to shine very bright, Henry, with some of his best officers, carefully examined the ground, and pitched upon a field of battle, admirably calculated to preserve a small army from being surrounded by a great one. It was a gentle declivity from the village of Agincourt, of sufficient extent for his small army, defended on each side by hedges, trees, and brush-wood. Having placed guards and kindled fires on all sides, the king and his army betook themselves to rest; except such as were of a more serious turn of mind, and, considering that as the last night of their lives, spent it devotion.

The French, exulting in their numbers, confident of victory, and abounding in provisions, spent the night in noisy festivity, and in forming fanciful schemes about the disposal of their prisoners and their booty. It was in general resolved to put all the English to the sword, except the king and the chief nobility, who were to be taken prisoners for the sake of their ransoms.

On the morning of Friday, the memorable 25th of October, A. D. 1415, the day of Crispin and Crispianus, the English and French armies were ranged in order of battle, each in three lines, with bodies of cavalry on each wing. The Constable D'Albert, who commanded the French army, fell into the snare that was laid for him, by drawing up his army in the narrow plain between the two woods. This deprived him, in a great measure, of the advantage he should have derived from the prodigious superiority of his numbers; obliged him to make his lines unnecessarily deep, about 30 men in file; to croud his troops, particularly his cavalry, so close together, that they could hardly move or use their arms; and, in a word, was the chief cause of all the disasters that followed. The French, it is said, had a considerable number of cannon of different sizes in the field; but we do not hear that they did any execution, probably for want of room. The first line of the French army, which consisted of 8000 men-at-arms on foot mixed with 4000 archers, with 500 men-at-arms mounted on each wing, was commanded by the Constable D'Albert, the dukes of Orleans and Bourbon, and many other nobles; the dukes of Alençon, Brabant, and Bar, &c. conducted the second line; and the earls of Marle, Damartine, Fauconberg, &c. were at the head of the third line. The king of England employed various arts to supply his defect of numbers. He placed 200 of his best archers in ambush, in a low meadow, on the flank of the first line of the French. His own first line consisted wholly of archers, four in file; each of whom, besides his bow and arrows, had a battle-axe, a sword, and a stake pointed with iron at both ends, which he fixed before him in the ground, the point inclining outwards, to protect him from cavalry; which was a new invention, and had a happy effect. That he might not be incumbered, he dismissed all his prisoners, on their word of honour to surrender themselves at Calais, if he obtained the victory; and lodged all his baggage in the village of Agincourt, in his rear, under a slender guard. The command of the first line was, at his earnest request, committed to Edward duke of York, assisted by the lords Beaumont, Willoughby, and Fanhope; the second was conducted by the king, with his youngest brother Humphrey duke of Gloucester, the earls of Oxford, Marshal, and Suffolk; and the third was led by the duke

Agincourt. duke of Exeter, the king's uncle. The lines being formed, the king, in shining armour, with a crown of gold adorned with precious stones on his helmet, mounted on a fine white horse, rode along them, and addressed each corps with a cheerful countenance and animating speeches. To inflame their resentment against their enemies, he told them, that the French had determined to cut off three fingers of the right hand of every prisoner; and to rouse their love of honour, he declared, that every soldier in that army who behaved well, should from henceforth be deemed a gentleman, and be intitled to bear coat-armour.

When the two armies were drawn up in this manner, they stood a considerable time gazing at one another in solemn silence. But the king, dreading that the French would discover the danger of their situation and decline a battle, commanded the charge to be sounded, about ten o'clock in the forenoon. At that instant, the first line of the English kneeled down, and kissed the ground; and then starting up, discharged a flight of arrows, which did great execution among the crowded ranks of the French. Immediately after, upon a signal being given, the archers in ambush arose, and discharged their arrows on the flank of the French line, and threw it into some disorder. The battle now became general, and raged with uncommon fury. The English archers, having expended all their arrows, threw away their bows, and, rushing forward, made dreadful havoc with their swords and battle-axes. The first line of the enemy was, by these means, defeated; its leaders being either killed or taken prisoners. The second line, commanded by the duke D'Alençon, (who had made a vow either to kill or take the king of England, or to perish in the attempt), now advanced to the charge, and was encountered by the second line of the English, conducted by the king. This conflict was more close and furious than the former. The duke of Gloucester, wounded and unhorsed, was protected by his royal brother till he was carried off the field. The duke D'Alençon forced his way to the king, and assaulted him with great fury; but that prince brought him to the ground, where he was instantly dispatched. Discouraged by this disaster, the second line made no more resistance; and the third fled without striking a blow; yielding a complete and glorious victory to the English, after a violent struggle of three hours duration.

The king did not permit his men to pursue the fugitives to a great distance, but encouraged them to take as many prisoners as they could on or near the field; in which they were so successful, that, in a little time, his captives were more numerous than his soldiers. A great proportion of these prisoners were men of rank and fortune; for many of the French noblesse being on foot, and loaded with their heavy armour, could not make their escape. Among these were the dukes of Orleans and Bourbon, the marshal Boucicaut, the counts D'Eu, Vendome, Richemont, and Harcourt, and 7000 barons, knights, and gentlemen. The French left dead on the field of battle, the constable D'Albert, the three dukes of Alençon, Brabant, and Bar, the archbishop of Sens, one marshal, 13 earls, 92 barons, 1500 knights, and a far greater number of gentlemen, besides several thousands of common soldiers. Even the French historians acknowledge, that the loss of the English was inconsiderable: those of English contemporary writers who make it the greatest, affirm, that it did not exceed 100, and that the duke of York and the earl of Suffolk were the only great men who fell on that side in this memorable action.

Agio ‖ Agis.

AGIO, in commerce, is a term chiefly used in Holland, and at Venice, to signify the difference between the value of bank-stock and the current coin. The agio in Holland is generally three or four *per cent.* and at Rome it is from 15 to 25 *per cent.* but at Venice the agio is fixed at 20 *per cent.*

AGIOSYMANDRUM, a wooden instrument used by the Greek and other churches, under the dominion of the Turks, to call together assemblies of the people. The *agiosymandrum* was introduced in the place of bells, which the Turks prohibited their Christian subjects the use of, lest they should make them subservient to sedition.

AGIS, king of Lacedæmon, was descended from Agesilaus II. in a right line. He projected the reformation of his kingdom, by the restoring of the laws of Lycurgus; but he fell under the weight of an enterprise that could not but be disagreeable to all those who had great possessions, and had been long accustomed to the sweets of a voluptuous life. Agis being in the flower of his age, and having a very refined desire of glory, practised the ancient discipline first in his own person: his clothes and his table were according to the manners of former times; which is so much the more to be admired, because Agesistrata his mother and Archidamia his grandmother had brought him up voluptuously. When he sounded his people's minds, he found the younger sort opposed his project less than those who had enjoyed a relaxation of discipline several years. The greatest difficulty was expected to arise from the women. They had at that time more credit than ever; for their power is never greater than when luxury is in fashion. Agesilaus's mother did not at all relish the proposed reformation. She must have lost her riches, which gave her a share in a thousand sorts of intrigues; so she opposed the design at once, and treated it as a chimera. But her brother Agesilaus, whom Agis had engaged in his interests, knew how to manage her in such a manner that she promised to second the enterprise. She endeavoured to gain the women: but instead of suffering themselves to be persuaded, they applied to Leonidas the other king of Lacedæmon, and humbly besought him to frustrate the designs of his colleague. Leonidas durst not oppose it openly, for fear of irritating the people; to whom the reformation was agreeable, because they found their account in it. He contented himself with countermining it by intrigues, and sowing suspicions as if Agis had aspired to tyranny, by pulling down the rich and raising the poor. Agis did not fail to propose his new laws to the senate, relating to the discharge of debts, and a new division of the lands. Leonidas, being supported by the rich, opposed this project so strongly, that there was one voice more against it than for it. He paid dear for his success in this affair. Lysander, one of the Ephori, who had been the grand promoter of the reformation, called him to account; alleged the celestial signs; and put to death Cleombrotus, a prince of the royal blood and son-in-law to Leonidas, to make sure of the kingdom.

Agistment, Agistor.

kingdom. Leonidas being frightened at this took refuge in a temple; whither his daughter, the wife of Cleombrotus, followed him. He was summoned: and because he did not appear, he was degraded of his dignity, which was conferred on Cleombrotus. He obtained leave to retire to Tegæa. The New Ephori had Lysander and Mandroclidas tried for innovation: these persuaded the two kings to unite and turn out these Ephori. The thing was brought about; but not without a great uproar in the city. Agesilaus, one of the Ephori that succeeded those who were just turned out would have caused Leonidas to be killed on the way to Tegæa, if Agis had not sent him a strong guard. The reformation might then have been established, if Agesilaus had not found means to elude the good intentions of the two kings. Whilst this was transacting, the Achaians asked assistance; which was given them, and Agis had the command of the troops. He acquired a good deal of reputation in this campaign. At his return, he found his affairs so embroiled by the ill conduct of Agesilaus, that it was impossible for him to mantain himself. Leonidas was recalled to Lacedæmon; Agis retired into the temple and Cleomenes into another. The wife of the latter behaved herself in such a manner that she became the admiration of every body. Leonidas was contented with banishing his son-in-law; after which he applied himself entirely to the ruin of Agis. One of the Ephori, who had no mind to return what Agesistrata had lent him, was the principal instrument of the misfortune of this family. Agis never went out of his sanctuary but to bathe. One day, as he was returning from thence to the temple, he was seized by that Ephorus and carried to prison. Then he was brought to his trial and condemned to death, and delivered to the executioner. His mother and grandmother used all the intreaty and importunity imaginable, that, as he was king of Lacedæmon, he might at least be permitted to plead his cause before the people. But they were apprehensive lest his words would make too great an impression, and therefore they ordered him to be strangled that very hour. The Ephorus who was in debt to Agesistrata permitted that princess to go into the prison; which he granted likewise to Agis's grandmother; but he gave orders to strangle them one after another. Agesistrata died in a manner that was extremely to her honour. The wife of Agis, who was a princess of great fortune and prudence, and one of the finest ladies in Greece, was forced away from her apartment by king Leonidas, and obliged to marry his son, who was then very young, and hardly fit for marriage.

AGISTMENT, Agistage, or Agistation, in law, the taking in other people's cattle to graze at so much *per* week. The term is peculiarly used for the taking cattle to feed in the king's forests, as well as for the profits arising from that practice.—It is also used, in a metaphorical sense, for any tax, burden, or change; thus, the tax levied for repairing the banks of Romney-marsh was called *agistamentum*.

AGISTOR, or Agistator, an officer belonging to forests, who has the care of cattle taken in to be grazed, and levies the moneys due on that account. They are generally called *quest-takers* or *gist-takers*, and are created by letters-patent. Each royal forest has four agistors.

Agisymba || Agmen.

AGISYMBA (anc. geog.), a district of Libya Interior, according to Agathemerus, situated to the south-east of the Æthiopes Anthropophagi; the parallel passing through which, at 16° to the south of the equator, was the utmost extent of the knowledge of the ancients to the south (Ptolemy).

AGITATION, the act of shaking a body, or tossing it backwards and forwards.

Agitation, in physics, is often used for an intestine commotion of the parts of a natural body. Fermentation and effervescence are attended with a brisk agitation of the particles.

Agitation is one of the chief causes or instruments of mixtion: by the agitation of the parts of the blood and chyle, in their continual circulation, sanguification is in a good measure effected. Butter is made out of milk by the same means: in which operation, a separation is made of the oleous parts from the serous, and a conjunction of the oleous together. Digestion itself is only supposed to be an insensible kind of agitation.

Agitation is reputed one of the symptoms of inspiration. Petit informs us *, that, in the last century, there arose in a church in Italy, for the space of a year, a vapour of an extraordinary kind, which put all the people into trembling and agitations, and unless they got away betimes, set them a dancing, with strange contortions and gesticulations. This seems to verify what has been related of the temple of Delphi.

* Petit. de Sybilla, l. i. Nouv. Rep. Lett. tom. viii. p. 1113.

Agitation is also used in medicine for a species of exercise popularly called *swinging*. Maurice prince of Orange found this method a relief against the severe pains of the gout and stone. Bartholine mentions fits of the toothach, deafness, &c. removed by vehement agitations of the body.

AGITATOR, in antiquity, a term sometimes used for a charioteer, especially those who drove in the circus at the curule games.

Agitators, in the English history, certain officers set up by the army in 1647, to take care of its interests.—Cromwell joined the agitators, only with a view to serve his own ends; which being once accomplished, he found means to get them abolished.

AGLAIA, the name of the youngest of the three Graces, espoused to Vulcan.

AGLIONBY (John), an English divine, chaplain in ordinary to king James I. a man of universal learning, who had a very considerable hand in the translation of the New Testament appointed by king James I. in 1604.

AGMEN, in antiquity, properly denotes a Roman army in march: in which sense, it stands contradistinguished from *acies*, which denoted the army in battle array; though, on some occasions, we find the two words used indifferently for each other. The Roman armies, in their marches, were divided into *primum agmen*, answering to our vanguard; *medium agmen*, our main-battle; and *postremum agmum*, the rear-guard. The order of their march was thus: After the first signal with the trumpets, &c. the tents were taken down, and the baggage packed up; at the second signal, the baggage was to be loaden on the horses and carriages; and at the third signal, they were to begin their march.

First

First came the *extraordinarii*; then the auxilliaries of the first wing, with their baggage; these were followed by the legions. The cavalry marched either on each side or behind.

AGNATE, in law, any male relation by the father's side.

AGNEL, an ancient French gold coin, first struck under the reign of St Louis, worth about twelve sols six deniers. The agnel is also called sometimes *mouton d'or*, and *agnel d'or*. The denomination is supposed to have arisen from the figure of a lamb, agnus, or sheep, struck on one side.

AGNO, a river of Naples, which, taking its rise in the mountainous parts of Terra di Lavoro, washes the town of Acerra; and, passing between Capua and Aversa, falls into the Mediterranean, about seven miles north of Puzzuoli.

AGNOETÆ (from αγνοεω, to be *ignorant* of,) in church-history, a sect of ancient heretics, who maintained that Christ, considered as to his human nature, was ignorant of certain things, and particularly of the time of the day of judgment. Eulogius, patriarch of Alexandria, ascribes this heresy to certain solitaries in the neighbourhood of Jerusalem, who built their opinion upon the text Mark xiii. 32 "Of that day and "hour knoweth no man, no not the angels who are "in heaven, neither the Son, but the Father only."—The same passage was made use of by the Arians; and hence the orthodox divines of those days were induced to give various explications thereof. Some allege, that our Saviour here had no regard to his divine nature, but only spoke of his human. Others understand it thus, That the knowledge of the day of judgment does not concern our Saviour considered in his quality of Messiah, but God only: which is the most natural solution.

AGNOMEN, in Roman antiquity, a kind of fourth or honorary name, given to a person on account of some extraordinary action, virtue, or other accomplishment. Thus the agnomen *Africanus* was bestowed upon Publius Cornelius Scipio, on account of his great atchievements in Africa.—The agnomen was the third in order of the three Roman names; thus, in Marcus Tullius Cicero, Marcus is the prænomen, Tullius the nomen, and Cicero the *agnomen*.

AGNUS, or LAMB, in zoology, the young of the ovis or sheep. See OVIS.

AGNUS Castus, in botany, the trivial name of a species of the vitex. See VITEX. The Greeks call it αγνος, *chaste*; to which has since been added the reduplicative *castus*, *q. d.* chaste chaste. It was famous among the ancients as a specific for the preservation of chastity. The Athenian ladies, who made profession of chastity, lay upon leaves of *agnus castus* during the feasts of Ceres.—Being reputed a cooler, and particularly of the genital parts, it was anciently used in physic to allay these inordinate motions arising from seminal turgescences: but it is out of the present practice.

AGNUS Dei, in the church of Rome, a cake of wax stamped with the figure of a lamb supporting the banner of the cross. These being consecrated by the pope with great solemnity, and distributed among the people, are supposed to have great virtues; as, to preserve those who carry them worthily, and with faith, from all manner of accidents; to expel evil spirits, &c. The name literally signifies *Lamb of God*; this being supposed an image or representation of the Lamb of God who took away the sins of the world. They cover it up with a piece of stuff cut in form of a heart, and carry it very devoutly in their processions.—The Romish priests and religious derive considerable pecuniary advantage from selling these *Agnus Deis* to some, and presenting them to others. The pope provides a regular supply, by consecrating once in seven years; they are distributed by the master of the wardrobe, and received by the cardinals and other prelates, with great reverence, in their caps and mitres.—This ceremony they pretend to derive from an ancient custom of the church, wherein part of the paschal taper consecrated on Holy Thursday was distributed among the people, to perfume their houses, fields, &c. in order to drive away devils, and to preserve them from storms and tempests. The *Agnus Dei* is forbidden to be brought into England under pain of incurring a *premunire*; 13 Eliz. cap. 2.

AGNUS Dei is also a popular name for that part of the mass wherein the priest, striking his breast three times, rehearses, with a loud voice, a prayer beginning with the words *Agnus Dei*.—The *Agnus Dei* is said to have been first brought into the missal by pope Sergius I.

AGNUS Scythicus. See *Scythian* LAMB.

AGOGE, among ancient musicians, a species of modulation, wherein the notes proceed by contiguous degrees.

AGON, among the ancients, implied any dispute or contest, whether it had regard to bodily exercises or the accomplishments of the mind; and therefore poets, musicians, painters, &c. had their agons, as well as the athletæ. Games of this kind were celebrated at most of the heathen festivals, with great solemnity, either annually, or at certain periods of years. Among the latter were celebrated at Athens, the *agon gymnicus*, the *agon nemeus* instituted by the Argives in the 53d Olympiad, and the *agon Olympius* instituted by Hercules 430 years before the first Olympiad.—The Romans also, in imitation of the Greeks, instituted contests of this kind. The emperor Aurelian established one under the name of *agon solis* the contest of the sun; Dioclesian another, which he called *agon capitolinus*, which was celebrated every fourth year, after the manner of the Olympic games. Hence the years, instead of *lustra*, are sometimes numbered by *agones*.

AGON also signified one of the ministers employed in the Heathen sacrifices, and whose business it was to strike the victim. The name is supposed to have been derived from hence, that standing ready to give the stroke he asked, *Agon'*? or *Agone*? Shall I strike?

AGONALES, an epithet given to the SALII.

AGONALIA, in Roman antiquity, festivals celebrated in honour of Janus, or the god Agonius, whom the Romans invoked before undertaking any affair of importance.

AGONALIS CIRCUS, now *La Piazza Navona*, a long, large, beautiful street in the heart of Rome, adorned with fountains, and the obelisk of Caracalla, still retaining the form of that circus. The reason of the name *Agonalis* is either unknown or doubtful. Ovid seems to derive it from the *agones*, or solemn games, there

there celebrated; supposed to have been the *Ludi Apollinares*, or *Actiaci*, instituted by Augustus; whence the circus was called *Apollinaris*; also *Alexandrinus*, from the emperor Alexander Severus, who either enclosed or repaired the circus.

AGONISMA, in antiquity, denotes the prize given to the victor in any combat or dispute.

AGONISTARCHA, from αγων "combat," and αρχος "chief," in antiquity, seems to have been much the same with *agonotheta*; though some suggest a difference, making it the office of the former to preside at and direct the private exercises of the athletæ, which they went through by way of practice, before they made their appearance on the public theatres or amphitheatres.

AGONISTICI, in church-history, a name given by Donatus to such of his disciples as he sent to fairs, markets, and other public places, to propagate his doctrine; for which reason they were also called *Circuitores*, *Circelliones*, *Catropitæ*, *Coropitæ*, and at Rome *Montenses*. They were called *Agonistici*, from the Greek αγον "combat," in regard they were sent as it were to fight and subdue the people to their opinions.

AGONIUM, in Roman antiquity, was used for the day on which the *rex sacrorum* sacrificed a victim, as well as for the place where the games were celebrated, otherwise called *agon*.

AGONOTHETA, or AGONOTHETES, in Grecian antiquity, was the president or superintendant of the sacred games; who not only defrayed the expence attending them, but inspected the manners and discipline of the athletæ, and adjudged the prizes to the victors.

AGONY, any extreme pain. It is also used for the pangs of death. Much of the terror of death consists in the pangs and convulsions wherewith the agony seems attended; though we have reason to believe that the pain in such cases is ordinarily not extremely acute; a course of pain and sickness having usually stupified and indisposed the nerves for any quick sensations.—However, various means have been thought of for mitigating the agony of death. Lord Bacon considers this as part of the province of a physician; and that not only when such a mitigation may tend to a recovery, but also when, there being no further hopes of a recovery, it can only tend to make the passage out of life more calm and easy. Complacency in death, which Augustus so much desired, is certainly no small part of happiness. Accordingly the author last cited ranks *euthanasia*, or the art of dying easily, among the desiderata of science; and does not even seem to disapprove of the course Epicurus took for that end,

——*Hinc stygias ebrius hausit aquas.*

Opium has been applied for this purpose, with the applause of some, but the condemnation of more.

AGONYCLITÆ, or AGONYCLITES, in church-history, a sect of Christians, in the 7th century, who prayed always standing, as thinking it unlawful to kneel.

AGORÆUS, in heathen antiquity, an appellation given to such deities as had statues in the market-place; particularly Mercury, whose statue was to be seen in almost every public place

AGORANOMUS, in Grecian antiquity, a magistrate of Athens, who had the regulation of weights and measures, the prices of provisions, &c.—The *agoranomi*, at Athens, were ten in number, five belonging to the city, and as many to the Piræus; though others make them fifteen in all, of whom they assign ten to the city. To these a certain toll or tribute was paid, by all who brought any thing to sell in the market.

AGOUTI, or AGUTI. See MUS.

AGRA, the capital town of a province of the same name, in Indostan, and in the dominions of the Great Mogul. It is looked upon as the largest city in these parts, and is in the form of a half-moon. A man on horseback can hardly ride round it in a day. It is surrounded with a wall of red stone, and with a ditch 100 feet wide. The palace is prodigiously large, and the seraglio commonly contains above 1000 women. There are upwards of 800 baths in this town; but that which travellers most admire, is the mausoleum of one of the Mogul's wives, which was 20 years in building. The indigo of Agra is the most valuable of all that comes from the East Indies. This town is seated on the river Jemma, about 50 miles above its confluence with the Tehemel, and is 300 miles N. E. of Surat. E. Long. 79. 12. N. 26. 29.

AGRARIAN LAWS, among the Romans, those relating to the division and distribution of lands; of which there were a great number; but that called the *Agrarian Law*, by way of eminence, was published by Spurius Cassius, about the year of Rome 268, for dividing the conquered lands equally among all the citizens, and limiting the number of acres which each citizen might enjoy.—The Roman lands were of several kinds; some conquered from the enemies, and not yet brought to the public account; others brought indeed to the public, but clandestinely usurped by private great men; lastly, others purchased with the public money, in order to be divided. Agrarian laws, either for dividing lands taken from the enemy, or the public lands, or those purchased with the public money, were easily passed with disturbance; but those whereby private rich men were to be deprived of their lands, and the common people put in possession of what had been held by the nobility, were never attempted without great disturbances.

Several have pleaded for the necessity of agrarian laws in England: but no author has entered so deeply into the subject as Mr Harrington in his *Oceana*; which the reader who chooses may consult.

AGREDA; a town of Spain, in Old Castile, near the frontiers of Arragon, and about three leagues south-west of Taracon.

AGRIA, called by the Germans *Eger*, is a small but strong town in Upper Hungary, and is a bishop's see. It is situated on a river of the same name, and has a citadel called Eriaw. It was besieged by the Turks in 1552, with 70,000 men: but they lost 8000 in one day; and were obliged to raise the siege, though the garrison consisted only of 2000 Hungarians, assisted by the women, who performed wonders on this occasion. However, it was afterwards taken by Mahomet III. in 1596; but was retaken by the emperor in 1687; since which time it has continued under the dominion of the house of Austria. It is 47 miles north-east of Buda, and 55 south-west of Cassovia. E. Long. 20. 10. N. Lat. 48. 10.

AGRICOLA, (Cneus Junius), born at Frejus in Pro-

Agricola.

Provence, was, in Vespasian's time, made lieutenant to Vettius Bolanus in Britain; and, upon his return, was ranked by that emperor among the patricians, and made governor of Aquitania. This post he held three years; and upon his return he was chosen consul, and afterwards appointed governor of Britain, where he greatly distinguished himself. He reformed many abuses occasioned by the avarice or negligence of former governors, put a stop to extortion, and caused justice to be impartially administered. Vespasian dying about this time, his son Titus, knowing the great merit of Agricola, continued him in the government. In the spring, he marched towards the north, where he made some new conquests, and ordered forts to be built for the Romans to winter in. He spent the following winter in concerting schemes to bring the Britons to conform to the Roman customs. He thought the best way of diverting them from rising and taking arms, was to soften their rough manners, by proposing to them new kinds of pleasure, and inspiring them with a desire of imitating the Roman manners. Soon after this, the country was adorned with magnificent temples, porticos, baths, and many other fine buildings. The British nobles had at length their sons educated in learning; and they who before had the utmost aversion to the Roman language, now began to study it with great assiduity: they wore likewise the Roman habit; and, as Tacitus observes, they were brought to consider those things as marks of politeness, which were only so many badges of slavery. Agricola, in his third campaign, advanced as far as the Tweed; and in his fourth, he subdued the nations betwixt the Tweed and the friths of Edinburgh and Dumbritton, into which the rivers Glotta and Bodotria discharge themselves; and here he built fortresses to shut up the nations yet unconquered. In his fifth, he marched beyond the friths; where he made some new acquisitions, and fixed garrisons along the western coasts, over against Ireland. In his sixth campaign he passed the river Bodotria, ordering his fleet, the first which the Romans ever had in those parts, to row along the coasts, and take a view of the northern parts. In the following spring, the Britains raised an army of 30,000 men; and the command was given to Galgacus, who, according to Tacitus, made an excellent speech to his countrymen on this occasion. Agricola likewise addressed his men in very strong and eloquent terms. The Romans gained the victory, and 10,000 of the Britains are said to have been killed. This happened in the reign of the emperor Domitian; who, growing jealous of the glory of Agricola, recalled him, under pretence of making him governor of Syria. Agricola died soon after; and his death is suspected to have been occasioned by poison given him by that emperor. Tacitus the historian married his daughter, wrote his life, and laments his death in the most pathetic manner.

Agricola (George), a German physician, famous for his skill in metals. He was born at Glaucha, in Misnia, the 24th of March 1492. The discoveries which he made in the mountains of Bohemia, gave him so great a desire of examining accurately into every thing relating to metals, that though he had engaged in the practice of physic at Joachimstal by advice of his friends, he still prosecuted his study of fossils with great assiduity; and at length removed to Chemnitz, where he entirely devoted himself to this study. He spent in pursuit of it the pension he had of Maurice duke of Saxony, and part of his own estate; so that he reaped more reputation than profit from his labours. He wrote several pieces upon this and other subjects; and died at Chemnitz the 21st of November 1555, a very firm Papist. In his younger years he seemed not averse to the Protestant doctrine; and he highly disapproved of the scandalous traffic of indulgences, and several other things in the church of Rome. The following lines of his were posted up in the streets of Zwickaw, in the year 1719:

Si nos injecto salvebit cistula nummo,
Heu nimium infelix tu mihi, pauper, eris!
Si nos, Christe, tua servatos morte beasti,
Tam nihil infelix tu mihi, pauper, eris.

If wealth alone salvation can procure,
How sad a state for ever waits the poor!
But if thou, Christ, our only saviour be,
Thy merits still may bless ev'n poverty!

In the latter part of his life, however, he had attacked the Protestant religion: which rendered him so odious to the Lutherans, that they suffered his body to remain unburied for five days together; so that it was obliged to be removed from Chemnitz to Zeits, where it was interred in the principal church.

Agricola (John), a Saxon divine born at Islebe in 1492. He went as chaplain to count Mansfield, when that nobleman attended the Elector of Saxony to the diet of Spire in 1526, and that of Augsburg, in 1530. He was of a restless ambitious temper, rivalled and wrote against Melancthon, and gave count Mansfield occasion to reproach him severely. He obtained a professorship at Wittemberg, where he taught particular doctrines, and became founder of the sect of Antinomians; which occasioned warm disputes between him and Luther, who had before been his very good friend. But though he was never able to recover the favour either of the elector of Saxony or of Luther, he received some consolation from the fame he acquired at Berlin; when he became preacher at court; and was chosen in 1548, in conjunction with Julius Phlug and Michael Heldingus, to compose the famous *Interim*, which made so much noise in the world. He died at Berlin in 1566.

AGRICULTURE

Definition.

MAY be defined, The art of disposing the earth in such a manner as to produce whatever vegetables we desire, in large quantity, and in the greatest perfection of which their natures are capable.—But though by this definition, agriculture, strictly speaking, includes in it the cultivation of every species of vegetable whatever, and consequently comprehends all that is understood of gardening and planting, we mean here to confine

fine ourselves to the cultivation of those species of grain, grass, &c. which are generally necessary as food for men and beasts.

History. The antiquity of this art is undoubtedly beyond that of all others; for we are informed by Scripture, that Adam was sent from the garden of Eden *to till the ground*; and, this being the case, he certainly must have known how to do so.—It would be ridiculous, however, to imagine that he was acquainted with all the methods of ploughing, harrowing, fallowing, &c. which are now made use of; and it would be equally so to suppose, that he used such clumsy and unartful instruments as wooden hooks, horns of oxen, &c. to dig the ground, which were afterwards employed for this purpose by certain savages: but as we know nothing of the particular circumstances in which he was situated, we can know as little concerning his method of agriculture.

The prodigious length of life which the antediluvians enjoyed, must have been very favourable to the advancement of arts and sciences, especially agriculture, to which it behoved them to apply themselves in a particular manner, in order to procure their subsistence. It is probable, therefore, that even in the antediluvian world, arts and sciences had made great progress, nay, might be farther advanced in some respects than they are at present. Of this, however, we can form no judgment, as there are no histories of those times, and the scripture gives us but very slight hints concerning these matters.

No doubt, by the terrible catastrophe of the flood, which overwhelmed the whole world, many sciences would be entirely lost, and agriculture would suffer; as it was impossible that Noah or his children could put in practice, or perhaps know, all the different methods of cultivating the ground that were formerly used. The common methods, however, we cannot but suppose to have been known to him and his children, and by them transmitted to their posterity: so that as long as mankind continued in one body without being dispersed into different nations, the arts, agriculture especially, would necessarily advance; and that they did so, is evident from the undertaking of the tower of Babel. It is from the dispersion of mankind consequent upon the confusion of tongues, that we must date the origin of savage nations. In all societies where different arts are cultivated, there are some persons who have a kind of general knowledge of most of those practised through the whole society, while others are in a manner ignorant of every one of them. If we suppose a few people of understanding to separate from the rest, and become the founders of a nation, it will probably be a civilized one, and the arts will begin to flourish from its very origin; but, if a nation is founded by others whose intellects are in a manner callous to every human science (and of this kind there are many in the most learned countries), the little knowledge or memory of arts that were among the original founders will be lost, and such a people will continue in a state of barbarism for many ages, unless the arts be brought to them from other nations.

From this, or similar causes, all nations of equal antiquity have not been equally savage, nor is there any solid reasons for concluding that all nations were originally unskilled in agriculture; though as we know not the original instruments of husbandry used by mankind when living in one society, we cannot fix the date of the improvements in this art. Different nations have always been in a different state of civilization; and agriculture, as well as other arts, has always been in different degrees of improvement among different nations at the same time.

From the earliest accounts of the eastern nations, we have reason to think, that agriculture has at all times been understood by them in considerable perfection; seeing they were always supplied not only with the necessaries, but the greatest luxuries of life.

As soon as the descendants of Abraham were settled in Palestine, they generally became husbandmen, from the chiefs of the tribe of Judah to the lowest branch of the family of Benjamin. High birth or rank did not at that time make any distinction, for agriculture was considered as the most honourable of all employments; witness the illustrious examples of Gideon, Saul, and David.

The Chaldeans, who inhabited the country where agriculture had its birth, carried that valuable art to a degree of excellence unknown in former times. They cultivated their lands with great assiduity, and seem to have found out some means of restoring fertility to an exhausted soil, by having plentiful harvests in succession; on which account they were not obliged, as their predecessors had been, to change their situations, in order to obtain a sufficiency for themselves and their numerous flocks and herds.

The Egyptians, who, from the natural fertility of their country by the overflowing of the Nile, raised every year vast quantities of corn, were so sensible of the blessings resulting from agriculture, that they ascribed the invention of that art to Osiris. They also regarded Isis, their second deity, as the discoverer of the use of wheat and barley, which before grew wild in the fields, and were not applied by that people to the purposes of food. Their superstitious gratitude was carried so far, as to worship those animals which were employed in tillage; and even to the produce of their lands, as leeks, onions, &c.

The divine honours paid to Bacchus in India were derived from the same source, he being considered in that country as the inventor of planting vineyards, and the other arts attendant upon agriculture.

It is also related of the ancient Persians, on the most respectable authority, that their kings laid aside their grandeur once every month to eat with husbandmen. This is a striking instance of the high estimation in which they held agriculture; for at that time arts were practised among that people in great perfection, particularly those of weaving, needle-work, and embroidery. The precepts of the religion taught by their ancient magi, or priests, included the practice of agriculture. The *saint* among them was obliged to work out his salvation by pursuing all the labours of agriculture: And it was a maxim of the Zendavesta, that he who sows the ground with care and diligence, acquires a greater degree of religious merit, than he could have gained by the repetition of ten thousand prayers.

The Phenicians, so well known in scripture by the name of *Philistines*, were also remarkable for the attention to, and skill in agriculture. But finding themselves felves too much difturbed and confined by the incurfions and conquefts of the Ifraelites, they fpread themfelves throughout the greateft part of the Mediterranean iflands, and carried with them their knowledge in the arts of cultivation.

Mago, a famous general of the Carthaginians, is faid to have written no lefs than 28 books on the fubject; which Columella tells us were tranflated into Latin by the exprefs order of the Roman fenate. We are informed by the ancient writers, that Ceres was born in Sicily, where fhe firft invented the arts of tillage and of fowing corn. For this effential fervice, fhe was, agreeably to the fuperftition of thofe ages, deified, and worfhipped as the goddefs of plenty. The truth of this is, that in the time of Ceres, the ifland, through her endeavours and the induftry of the people, became very fruitful in corn; and agriculture was there efteemed fo honourable an employment, that even their kings did not difdain to practife it with their own hands.

But time, which at firft gave birth to arts, often caufed them to be forgotten when they were removed from the place of their origin. The defcendants of Noah, who fettled in Europe, doubtlefs carried their knowledge of agriculture with them into the regions which they fucceffively occupied. But thofe who took poffeffion of Greece were fuch an uncivilized race, that they fed on roots, herbs, and acorns, after the manner of beafts. Pelafgus had taught them the culture of the oak, and the ufe of acorns as food; for which fervice, we are told, divine honours were paid him by the people.

The Athenians, who were the firft people that acquired any tincture of politenefs, taught the ufe of corn to the reft of the Greeks. They alfo inftructed them how to cultivate the ground, and to prepare it for the reception of the feed. This art we are told, was taught them by Triptolemus. The Greeks foon perceived that bread was more wholefome, and its tafte more delicate than that of acorns and the wild roots of the fields; accordingly they thanked the gods for fuch an unexpected and beneficial prefent, and honoured their benefactor.

As the arts of cultivation increafed, and the bleffings they afforded became generally experienced, the people foon preferred them to whatever the ravages of conqueft, and the cruel depredations of favage life, could procure. And accordingly we find, that the Athenian kings, thinking it more glorious to govern a fmall ftate wifely, than to aggrandize themfelves, and enlarge the extent of their dominions by foreign conquefts, withdrew their fubjects from war, and moftly employed them in cultivating the earth. Thus, by continued application, they brought agriculture to a confiderable degree of perfection, and foon reduced it to an art.

Hefiod was the firft we know of among the Greeks who wrote on this interefting fubject. According to the cuftom of the Oriental authors, he wrote in poetry, and embellifhed his poem with luxuriant defcriptions and fublime imagery. He calls his poem *Weeks and Days*, becaufe agriculture requires exact obfervations on times and feafons.

Xenophon has alfo, in his Oeconomics, remarked, that agriculture is the nurfing mother of the arts For, fays he, "where agriculture fucceeds profperoufly, there the arts thrive; but where the earth neceffarily lies uncultivated, there the other arts are deftroyed."

Other eminent Greek writers upon agriculture were, Democritus of Abdera, Socraticus, Archytas, Tarentinus, Ariftotle, and Theophraftus, from whom the art received confiderable improvements.

The ancient Romans efteemed agriculture fo honourable an employment, that the moft illuftrious fenators of the empire, in the intervals of public concerns, applied themfelves to this profeffion; and fuch was the fimplicity of thofe ages, that they affumed no appearance of magnificence and fplendor, or of majefty, but when they appeared in public. At their return from the toils of war, the taking of cities, and the fubduing of hoftile nations, their greateft generals were impatient till they were again employed in the arts of cultivation.

Regulus, when in Africa, requefted of the fenate to be recalled, left his farm might fuffer, for want of proper cultivation, in his abfence; and the fenate wrote him for anfwer, that it fhould be taken care of at the public expence, while he continued to lead their armies.

Cato the cenfor, after having governed extenfive provinces, and fubdued many warlike nations, did not think it below his dignity to write a Treatife on Agriculture. This work (as we are told by Servius) he dedicated to his own fon, it being the firft Latin treatife written on this important fubject; and it has been handed down to us in all its purity, in the manner that Cato wrote it.

Varro compofed a treatife on the fame fubject, and on a more regular plan. This work is embellifhed with all the Greek and Latin erudition of that learned author, who died 28 years before the commencement of the Chriftian æra. Virgil, who lived about the fame time, has, in his Georgics, adorned this fubject with the language of the Mufes, and finely illuftrated the precepts and rules of hufbandry left by Hefiod, Mago, and Varro.

Columella, who flourifhed in the reign of the emperor Claudius, wrote 12 books on hufbandry, replete with important inftruction.

From this period to that of the reign of Conftantine Poganatus, hufbandry continued in a declining ftate; but that wife emperor caufed a large collection of the moft ufeful precepts relating to agriculture to be extracted from the beft writers, and publifhed them under the title of *Geoponics*. It has been afferted, that he made this collection with his own hand; and the truth of the affertion is not improbable, as it is well known, that after he had conquered the Saracens and the Arabians, he not only practifed and encouraged, but ftudied the arts of peace, fixing his principal attention on agriculture, as their beft foundation.

After the death of Conftantine, however, the increafing attention of the people to commerce, and the ignorance and grofs fuperftition of the ages which fucceeded, feems to have rendered agriculture an almoft neglected fcience. The irruptions of the northern nations foon abolifhed any improved fyftem. Thefe innumerable and enterprifing barbarians, who over-ran all Europe, were originally fhepherds or hunters, like the prefent Tartars and the favages of America. They contented themfelves with poffeffing thofe vaft defarts made by their own ravages, without labour or trouble, cultivating only a very small spot near their habitations; and in this trifling husbandry only the meanest slaves were employed; so that the art itself, which formerly was thought worthy of the study of kings, was now looked upon as mean and ignoble; a prejudice which is scarcely effaced at present, or at least but very lately. —During this period, therefore, we find no vestiges of any thing tolerably written on the subject. No new attempts were made to revive it, or to improve it, till the year 1478, when Crescenzio published an excellent performance on the subject at Florence. This rouzed the slumbering attention of his countrymen, several of whom soon followed his example. Among these, Tatti, Steffano Augustino Gallo, Sansovino, Lauro, and Tarello, deserve particular notice.

At what time agriculture was introduced into Britain, is uncertain. When Julius Cæsar first invaded that island, it was not wholly unknown. That conqueror was of opinion, that agriculture was first introduced by some of those colonies from Gaul which had settled in the southern parts of Britain, about 100 yerrs before the Roman invasion *.

* Cæsar de Bell. Gall. lib. 5. c. 12.

It is not to be expected that we can now be acquainted with many of the practices of these ancient husbandmen. It appears, however, that they were not unacquainted, with the use of manures, particularly marle. This we have on the authority of Pliny †, who tells us, that it was peculiar to the people of Gaul and of Britain; that its effects continued 80 years; and that no man was ever known to marle his field twice, &c.—It is highly probable, too, that lime was at this time also used as a manure in Britain, it being certainly made use of in Gaul for this purpose at the time of Julius Cæsar's invasion.

† Plin. Nat Hist. lib. 17. c. 6.

The establishment of the Romans in Britain produced great improvements in agriculture, insomuch that prodigious quantities of corn were annually exported from the island; but when the Roman power began to decline, this, like all the other arts, declined also, and was almost totally destroyed by the departure of that people. The unhappy Britons were now exposed to frequent incursions of the Scots and Picts, who destroyed the fruits of their labours, and interrupted them in the exercise of their art. After the arrival of the Saxons in the year 449, they were involved in such long wars, and underwent so many calamities, that the husbandmen gradually lost much of their skill, and were at last driven from those parts of the country which were most proper for cultivation.

After the Britons retired into Wales, though it appears from the laws made relative to this art, that agriculture was thought worthy of the attention of the legislature, yet their instruments appear to have been very unartful It was enacted that no man should undertake to guide a plough who could not make one; and that the driver should make the ropes of twisted willows, with which it was drawn. It was usual for six or eight persons to form themselves into a society for fitting out one of these ploughs, providing it with oxen and every thing necessary for ploughing; and many minute and curious laws were made for the regulation of such societies. If any person laid dung on a field with the consent of the proprietor, he was by law allowed the use of that land for one year. If the dung was carried out in a cart in great abbundance, he was to have the use of the land for three years. Whoever cut down a wood, and converted the ground into arable, with the consent of the owner, was to have the use of it for five years. If any one folded his cattle, for one year, upon a piece of ground belonging to another, with the owner's consent, he was allowed the use of that field for four years.

Thus, though the Britons had in a great measure lost the kowledge of agriculture, they appear to have been very assiduous in giving encouragement to such as would attempt a revival of it; but, among the Anglo-Saxons, things were not at present in so good a state. These restless and haughty warriors, having contracted a distaste and contempt for agriculture, were at pains to enact laws to prevent its being followed by any other than women and slaves. When they first arrived in Britain, they had no occasion for this art, being supplied by the natives with all the necessaries of life. After the commencement of hostilities, the Saxons subsisted chiefly by plunder: but having driven out or extirpated most of the ancient Britons, and divided their lands among themselves, they found themselves in danger of starving, there being now no enemy to plunder; and therefore they were obliged to apply to agriculture.

The Saxon princes and great men, who, in the division of the lands, had received the greatest shares, are said to have subdivided their estates into two parts, which were called the *in-lands* and the *out-lands*. The in-lands were those which lay most contiguous to the mansion-house of their owner, which he kept in his own possession, and cultivated by his slaves, under the direction of a bailiff, for the purpose of raising provisions for the family. The out-lands were those at a greater distance from the house, and were let to the *ceorls*, or farmers of those times, at very moderate rents. By the laws of Ina king of the west Saxons, who reigned in the end of the seventh and beginning of the eighth century, a farm consisting of ten hides, or plough-lands, was to pay the following rent; "Ten casks of honey; three hundred loaves of bread; twelve casks of strong ale; thirty casks of small ale; two oxen; ten wedders; ten geese; twenty hens; ten cheeses; one cask of butter; five salmon; twenty pounds of forage; and one hundred eels." From this low rent, the imperfection of agriculture at that time is easily discoverable; but it is still more so from the low prices at which land was then sold. In the ancient history of the church of Ely, published by Dr Gale, there are accounts of many purchases of lands by Ædelwold the founder of that church, and by other benefactors, in the reign of Edgar the Peaceable, in the tenth century. By a comparison of these accounts it appears, that the ordinary price of an acre of the best land in that part of England, in those times was no more than 16 Saxon pennies, or about four shillings sterling: a very trifling price, even in comparison with that of other commodities at the same time, for, by comparing other accounts, it appears, that four sheep were then equal in value to an acre of the best land, and one horse of the same value with three acres. The frequent and deplorable famines which afflicted England about this time, are further instances of the wretched state of agriculture. In 1043, a quarter of wheat sold for from 60 Saxon pennies (15 shillings sterling), and at that time equal in value to seven or eight pounds sterling at present.

The invasion of the Normans, in 1066, contributed very much to the improvement of agriculture; for, by that event, many thousands of husbandmen from Flanders, France, and Normandy, settled in Britain, obtained estates or farms, and cultivated them after the manner of their country. The implements of husbandry, used at this time, were of the same kind with those employed at present; but some of them were less perfect in their construction. The plough, for example, had but one stilt or handle, which the ploughman guided with one hand, having in his other hand an instrument which served both for cleaning and mending the plough, as well as for breaking the clods. The Norman plough had two wheels; and in the light soil of Normandy was commonly drawn by one or two oxen; but, in England, a greater number was often necessary. In Wales, the person who conducted the oxen in the plough walked backwards. Their carts, harrows, scythes, sickles, and flails, from the figures of them still remaining, appear to have been nearly of the same construction with those that are now used. In Wales, they did not use a sickle for reaping their corn, but an instrument like the blade of a knife, with a wooden handle at each end.---Their chief manure, next to dung, seems still to have been marle. Summer fallowing of lands designed for wheat, and ploughing them several times, appear to have been frequent practices of the English farmers in this period.

We are, after all, very much in the dark with respect to the state and progress of agriculture in Great Britain previous to the fourteenth century. That it was pretty generally practised, especially in the eastern, south, and midland parts of England, is certain; but of the mode, and the success, we are left almost totally ignorant. In the latter end of the fifteenth century, however, it seems to have been cultivated as a science, and received very great improvement.

At this time in England Fitzherbert, Judge of the Common-Pleas, shone forth with distinguished eminence in the practical parts of husbandry. He appears to have been the first Englishman who studied the nature of soils, and the laws of vegetation, with philosophical attention. On these he formed a theory confirmed by experiments, and rendered the study pleasing as well as profitable, by realizing the principles of the ancients, to the honour and advantage of his country. Accordingly, he published two treatises on this subject: the first, intitled *The Book of Husbandry*, appeared 1534; and the second, called *The Book of Surveying and Improvements*, in 1539. These books, being written at a time when philosophy and science were but just emerging from that gloom in which they had long been buried, were doubtless replete with many errors; but they contained the rudiments of true knowledge, and revived the study and love of an art, the advantages of which were obvious to men of the least reflection. We therefore find that Fitzherbert's books on Agriculture soon raised a spirit of emulation in his countrymen, and many treatises of the same kind successively appeared, which time has however deprived us of, or at least they are become so very scarce as only to be found in the libraries of the curious.

About the year 1600, France made some considerable efforts to revive the arts of husbandry, as appears from several large works, particularly *Les Moyens de devenir Riche*; and the *Cosmopolite*, by Bernard de Palissy, a poor porter, who seems to have been placed by fortune in a station for whith nature never intended him; *Le Theatre d'Agriculture*, by Deserres; and *L'Agriculture et Maison Rustique*, by Messrs Etienne; Liebault, &c.

Nearly in the same period, the practice of husbandry became more prevalent among this people and the Flemings than the publishing of books on the subject. Their intention seemed to be that of carrying on a private lucrative employment, without instructing their neighbours. Whoever therefore became desirous of copying their method of agriculture, was obliged to visit that country, and make his own remarks on their practice.

The principal idea they had of husbandry was, by keeping the lands clean and in fine tilth, to make a farm resemble a garden as nearly as possible.

Such an excellent principle, at first setting out, led them of course to undertake the culture of small farms only, which they kept free from weeds, continually turning the ground, and manuring it plentifully and judiciously. When they had by this method brought the soil to a proper degree of cleanliness, health, and sweetness, they chiefly cultivated the more delicate grasses, as the surest means of obtaining a certain profit upon a small estate, without the expence of keeping many draught horses and servants. A few years experience was sufficient to convince them, that ten acres of the best vegetables for feeding cattle, properly cultivated would maintain a larger stock of grazing animals than forty acres of common farm grass on land badly cultivated. They also found, the best vegetables for this purpose were lucerne, saintfoin, trefoil of all kinds, field turnips, &c.

The grand political secret of their husbandry, therefore, consisted in letting farms on improvement. They are said also to have discovered nine sorts of manure; but what they all were we are not particularly informed. We find, however, that marle was one of them; the use and virtues of which appear also to have been well known in England two hundred years ago, although it was afterwards much neglected. They were the first people among the moderns who ploughed in green crops for the sake of fertilizing the soil; and who confined their sheep at night in large sheds built on purpose, the floors of which were covered with sand or virgin earth, &c. which the shepherd carted away each morning to the compost dunghill.

In England, during the civil wars, though the operations and improvements in husbandry suffered some temporary checks, there flourished several excellent writers on the subject, and the art itself received considerable encouragement. Sir Hugh Platt was one of the most ingenious husbandmen of the age in which he lived; yet so great was his modesty, that all his works, except his Paradise of Flora, seem to be posthumous. He held a correspondence with most of the lovers and patrons of agriculture and gardening in England; and such was the justice and modesty of his temper, that he always named the author of every discovery communicated to him. Perhaps no man in any age discovered, or at least

least brought into use, so many new kinds of manure. This will be evident to those who read his account of the compost and covered dung-hills, and his judicious observations on the fertilizing qualities lodged in salt, street-dirt, and the sullage of streets in great cities, clay, fuller's earth, moorish earths, dung-hills made in layers, fern, hair, calcination of all vegetables, malt-dust, willow-tree earth, soaper's ashes, urine, marle, and broken pilchards.

Gabriel Plattes may be said to have been an original genius in husbandry. He began his observations at an earlier period, in the reign of Queen Elizabeth, and continued them down to the Commonwealth. But notwithstanding the great merit of this writer, and the essential service he had rendered his country by his writings, the public ungratefully suffered him to starve and perish in the streets of London; nor had he a shirt on his back when he died.

Samuel Hartlib, a celebrated writer on agriculture in the last century, was highly esteemed and beloved by Milton, and other great men of his time. In the preface to his work intitled *His Legacy*, he laments that no public director of Husbandry was established in England by authority; and that they had not adopted the Flemish method of letting farms upon improvement. This remark of Hartlib's procured him a pension of L. 100 a-year from Cromwell; and the writer afterwards, the better to fulfil the intention of his benefactor, procured Dr Beatti's excellent annotation on the Legacy, with other valuable papers from his numerous correspondents.

The time in which Hartlib flourished seems to have been an æra when the English husbandry rose to great perfection, compared with that of former ages; for the preceding wars had impoverished the country gentlemen, and of course made them industrious. They found the cultivation of their own lands to be the most profitable station they could fill. But this wise turn was not of long continuance. At the restoration, they generally became infected with that intoxication and love of pleasure which succeeded. All their industry, and knowledge were exchanged for neglect and dissipation; and husbandry descended almost entirely into the hands of common farmers.

Evelyn was the first writer who inspired his countrymen with a desire of reviving the study of agriculture; and he was followed by the famous Jethro Tull. The former, by his admirable treatises on earth and on planting, and the latter, by showing the superior advantages of the drill-husbandry, excited numbers to bring their theory to the test of fair experiment.

Many valuable and capital improvements have, since that period, been made in English husbandry; and these great men have been succeeded by a variety of writers, many of whom have done essential service, by enlightening the minds of their countrymen, and exciting them to emulation.

About the middle of the last century, Ireland began to make a considerable figure in the art of husbandry. It must indeed be confessed, that the Irish had very strong prejudices in favour of a wretched method of agriculture, till Blyth opened their eyes by his excellent writings. Since that time, a spirit of improvement has more or less been promoted, and in many instances carried on with great zeal, by the nobility, clergy, and gentry of that kingdom. In proof of this, it will be sufficient to observe, that the Transactions of the Dublin Society for encourageing Husbandry are now cited by all foreigners in their memoirs relating to that subject. And the observations of that discerning and judicious writer, Arthur Young, Esq; in his late Tour through that kingdom, show, that in many respects improvements there have of late years made a progress nearly as rapid as in England.

After the peace of Aix-la-Chapelle, most of the nations of Europe, by a sort of tacit consent, applied themselves to the study of agriculture, and continued to do so, more or less, amidst the universal confusion that succeeded.

The French found, by repeated experience, that they could never maintain a long war, or procure a tolerable peace, unless they could raise corn enough to support themselves in such a manner as not to be obliged to harsh terms on the one hand, or to perish by famine on the other. This occasioned the king to give public encouragement to agriculture, and even to be present at the making of several experiments. The great, and the rich of various ranks and stations, followed his example; and even the ladies were candidates for a share of fame in this public-spirited and commendable undertaking.

During the hurry and distresses of France in the war of 1756, considerable attention was paid to agriculture. Prize-questions were annually proposed in their rural academies, particularly those of Lyons and Bourdeaux; and many judicious observations were made by the Society for improving agriculture in Brittany.

Since the conclusion of that war in 1763, matters have been carried on there with great vigour. The university of Amiens made various proposals for the advancement of husbandry; and the Marquis de Tourbilly (a writer who proceeded chiefly on experience) had the principal direction of a Georgical society established at Tours.

The society at Rouen also deserves notice; nor have the king and his ministers thought it unworthy their attention. There are at present about fifteen societies existing in France, established by royal approbation, for the promoting of agriculture; and these have twenty co-operating societies belonging to them.

About this time vigorous exertions began to be made in Russia to introduce the most approved system of husbandry which had taken place in other parts of Europe. The present Empress has sent several gentlemen into Britain and other countries to study agriculture, and is giving it all possible encouragement in her own dominions.

The art of agriculture has also been for near 30 years publicly taught in the Swedish, Danish, and German universities, where the professors may render effectual service to their respective countries, if they understand the practical as well as the speculative part, and can converse with as much advantage with the farmer as with Virgil and Columella.

Even Italy has not been totally inactive. The Neapolitans of this age have condescended to recur to the first rudiments of revived husbandry, and begun to study anew the Agricultural System of Crescenzio, first published in 1478. The people of Bergamo have pursued

sued the same plan, and given a new edition of the Ricordo d'Agricolture de Tarello, first published in 1577. The duchy of Tuscany have imbibed the same spirit for improvement. A private gentleman, above 40 years since, left his whole fortune to endow an academy of agriculture. The first ecclesiastic in the duchy is president of this society, and many of the chief nobility are members.

His Sardinian Majesty has also sent persons to learn the different modes of practice in foreign countries; and made some spirited attempts to establish a better method of agriculture among his subjects.

In Poland, also, M. De Bieluski, grand marshal of the crown, has made many successful attempts to introduce the new husbandry among his countrymen; and procured the best instruments for that purpose from France, England, and other parts of Europe.

The Hollanders are the only people now in Europe who seem to look upon agriculture with indifference. Except the single collateral instance of draining their fens and morasses, they have scarcely paid any attention to it; and even this seems to have proceeded more from the motive of self-preservation than any love of, or disposition to, husbandry.

In the year 1756, a few ingenious and public-spirited men at Berne in Switzerland established a society for the advancement of agriculture and rural œconomics. In that society were many men of great weight in the republic, and most of them persons of a true cast for making improvements in husbandry, being enabled to join the practice with the theory.

Nor must we here omit to mention, that the justly celebrated Linnæus and his disciples have performed great things in the north of Europe, particularly in discovering new kinds of profitable and well-tasted food for cattle. About the same time, Sweden bestowed successful labours on a soil which had before been looked upon as cold, barren, and incapable of melioration. Of this the Stockholm Memoirs will be a lasting monument.

Denmark, and many of the courts in Germany, followed the same example. Woollen manufactures were encouraged, and his Danish Majesty sent three persons into Arabia Felix to make remarks, and bring over such plants and trees as would be useful in husbandry, building, and rural affairs.

The duchy of Wirtemburgh, also, a country by no means unfertile, but even friendly to corn and pasturage, has contributed its assistance towards the improvement of agriculture, having more than 30 years since published 14 œconomical relations at Stutgard.

Neither must we forget the very assiduous attention of the learned in Leipsic and Hanover to this important object. During the rage and devastation of a long war, they cultivated the arts of peace; witness the *Journal d'Agriculture* printed at Leipsic, and the *Recueils d'Hanover* printed in that city.

Even Spain, constitutionally and habitually inactive on such occasions, in spite of all their natural indolence, and the prejudices of bigotry, invited Linnæus, with the offer of a large pension, to superintend a college founded for the purpose of making new enquiries into the history of Nature and the art of agriculture.

Among the Japanese, agriculture is in great repute; and among the Chinese it is distinguished and encouraged by the court beyond all other sciences. The Emperor of China yearly, at the beginning of spring, goes to plough in person, attended by all the princes and grandees of the empire. The ceremony is performed with great solemnity; and is accompanied with a sacrifice, which the emperor, as high-priest, offers to Chang-Ti, to ensure a plentiful crop in favour of his people.

But, without any improper partiality we are fully justified in asserting, that Britain alone exceeds all modern nations in husbandry; and from the spirit which for the last twenty years has animated many of her nobility and gentry, to become the liberal patrons of improvement, there is reason to believe that this most useful of arts will, in a few years, be carried to a greater pitch of perfection than it has ever yet attained in any age or country.—The Royal Society, the Bath Society, and the Society of Arts, &c. in particular, have been signally useful in this respect; and the other associations, which are now established in many parts of the kingdom, co-operate with them in forwarding their laudable design.

It is not, however, to the exertion of public societies, excellent and honourable as they are, that all the modern improvements in agriculture owe their origin. To the natural genius of the people have been added the theory and practice of all nations in ancient and modern times. This accumulated mass of knowledge has been arranged, divided, and subdivided; and after passing the test of practical experiments, the essential and most valuable parts of it have been preserved, improved, and amply diffused in the works of Lord Kames, Mr Young, Stillingfleet, Dr Hunter, Anderson, Dickson, Ellis, Randal, Lisle, Marshal, Mortimer, Duhamel, Bradley, Kent, Mills, and a few other writers upon this grand art of rendering mankind happy, wealthy, and powerful.

PART I. THEORY OF AGRICULTURE.

1
Ignorance of the food of vegetables, the reason of imperfection in the theory of agriculture.

IN an art so extensively useful to mankind, and which has been so universally practised since the creation of the world, it is natural to expect the most exact and and perfect theory. But in this we are totally disappointed.

One reason of this want of a distinct theory of agriculture is, the ignorance of what is properly the food of vegetables; for as the art of agriculture consists principally in supplying them with a proper quantity of food, in the most favourable circumstances, it is evident, we might proceed upon a much surer foundation if we could ascertain what their proper nourishment is, than we can do without this knowledge. —The reason of the great differences regarding the practice, probably, is the difficulty of making experiments in agriculture. It is not in this art as in Mechanics, Chemistry, &c. where an experiment can be made in hour, or a day or two at farthest: an experiment in agriculture cannot be properly made in less than several years. Some favourable unobserved circumstances, quite foreign to the experiment itself, may concur to produce plentiful crops for a year or two:

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and thus the farmer may be induced to publish his fancied improvements; which falling in the hands of others, or perhaps even in his own on a repetition of the experiment, the new improvements are totally neglected, and things continue in their old way. Were he, however, capable of seeing and handling the food of vegetables, as well as he can do that of a horse or an ox, and procuring it in any imaginable quantity, it is plain, that he would be able to cause vegetables grow in their utmost luxuriancy, or, if we may be allowed the expression, *fatten* them, with as great certainty as he can fatten a horse or an ox, when he hath plenty of proper food to give them.—To ascertain what this food is, therefore, must be a step towards the perfection of agriculture; and to this we shall contribute our endeavour.

SECT. I. *Of the proper Food of Plants.*

2 Various suppositions concerning the food of plants.

WE shall not here spend time in refuting the theories of those who imagined the vegetable food to consist of oily and saline substances. A more probable supposition has been, That Water and Air are the proper vegetable food, to which alone they owe their increase in bulk and weight.—That plants cannot be supported without both these is very certain; but we know, that air is a compound fluid; and water is never without some impurities, so may also be considered as a compound.—Is it then the aqueous, the earthy, the acid, or the phlogistic part of the air, which nourishes plants? In like manner, is it the pure elementary part of water which nourishes them? or does it contribute to their growth only by the heterogeneous substances which it contains?

3 Vegetables thrive in putrid air.

From Dr Priestley's experiments on different kinds of air, it appears that the purest kind of that fluid is not the fittest for the purposes of vegetation. On the contrary, vegetables flourished in a surprising degree when confined in a small quantity of air made perfectly noxious by the putrid effluvia of animal bodies.—Hence it appears probable, that such effluvia, or, in other words, the essence of corrupted matter, constitute at least one species of vegetable food; and when vegetables are put into such circumstances that the steams of putrefying bodies can have access to them, we are sure they will thrive the better.

4 Water capable of imbibing putrid effluvia.

The Doctor also found, that by agitating putrid air in water, part of which was exposed to the atmosphere, the water acquired a very putrid noxious smell; which shows, that water, as well as air, is capable of absorbing those effluvia which are found proper food for vegetables. We cannot help concluding, therefore, that in the continual ascent of water in vapour, and its descent again in rain, which is a much more effectual *agitation* than could be made by Dr Priestley, the water must be very intimately combined with the *phlogistic* or putrid effluvia which are contained in the air. To this union we are led strongly to suspect that rain-water owes its fertilizing qualities; for the purest spring waters, though most wholesome for animals, are not found to be fittest

5 Putrid effluvia the proper food of plants.

for promoting the growth of vegetables.—As, therefore, vegetables evidently receive nourishment both by their leaves and roots, and increase remarkably in bulk by absorbing the putrid effluvia from the air; and as they likewise increase in bulk by admitting water to their roots, and more so when the water contains much of that kind of effluvium than when it contains less: so we would conclude, that the nourishment received by the roots of plants is of the same kind with that received by their leaves; and that this food may be given them in greater plenty than they naturally receive it, by impregnating the air which surrounds them, or the water which moistens them, with a greater quantity of putrid matter than what they contain in a natural state.

SECT. II. *The foregoing Theory confirmed from considerations on the nature of vegetable Mould, and the different kinds of Manure found proper for fertilizing the Soil.*

6 All kinds of earth not equally proper for nourishing vegetables.

THOUGH plants will grow on any kind of earth, and flourish vigorously, if plentifully supplied with water; yet some kinds of soils are found much more proper for supplying them with nourishment than others.—We cannot, indeed, allow the inferences to be quite fair which some would draw from experiments on plants set in mere sand, &c.; viz. that the earth is of no other use to vegetation than to afford a proper support to the plant, that it be not easily moved out of its place; because the experiments made on single vegetables are always performed in or very near houses, where the air is by no means so pure as in the open fields, and consequently where they have an opportunity of receiving as much nourishment from the air as may compensate the want of what they would have derived from the earth if planted in a rich soil. Lord Kames, in the Gentleman Farmer, mentions an experiment wherein a pea was planted on some cotton spread on water, in a phial. It sprung, and pushed roots through the cotton into the water. The plant grew vigorously, and, at the time of his writing the experiment, carried large pods full of ripe seed.—From this experiment, or others of a similar kind, however, a farmer would not be thought to act very judiciously, who should conclude that nothing more was requisite to produce a plentiful crop, than to keep his fields constantly soaking with water, and apply his labour only for that purpose, without regarding either tillage, manure, or the difference of soils. Experience has abundantly shown, that by certain operations performed on the earth itself, it is rendered much more capable of supplying vegetables with plenty of nourishment than if such operations were omitted; and that some kinds of soils cannot without certain additions be rendered so fit for this purpose as others; and this is what constitutes the difference between a *rich* and a *poor* soil.

7 Of the true vegetable earth.

That species of earth which is capable of supplying the vegetable kingdom with nourishment in the greatest plenty, is found best in well cultivated gardens. It is not, however, even in these, found in perfect purity; being constantly mixed with greater or less proportions of sand, small stones, &c. It can be had by itself, and entirely separated from all other substances, only by suffering vegetable or animal bodies to putrefy. By undergoing this operation, they are at last resolved into a kind of earth, which appears perfectly the same, from whatever substance it is produced. Of this earth Dr Lewis gives us the following characters. It is indissoluble

dissoluble in acids, somewhat tenacious when moistened with water, friable when dry, and acquires no additional hardness in the fire.—The chemistry of nature, and that of art, however, are so very dissimilar, that an account of the chemical properties of this earth can be but of very little service to the practice of agriculture; however, to those abovementioned we may add, that when it is distilled with a violent fire, a volatile alkaline spirit, and fœtid oil, similar to those of hartshorn or other animal substances, are obtained.

8
This earth impregnated with putrid effluvia.

As the volatile alkali is known to be produced in great plenty by distilling putrid substances either animal or vegetable, the obtaining an alkaline spirit from this kind of earth is a strong argument of its being much impregnated with the putrid effluvium, which we have already mentioned as the proper vegetable food contained in the air and water. Indeed, considering that this kind of earth is produced by putrefaction, it is next to an impossibility that it should not be impregnated with putrid steams, as much as earth can be; and if the earth which is most impregnated with these steams is found to afford the greatest quantity of nourishment to vegetables, we have from thence an additional proof that they live on the putrid matter emitted from dead animals and vegetables like themselves.

9
Earth is capable of absorbing putrid steams in prodigious quantities.

That we may be the more ascertained of this, it must be considered, that the earth, which undoubtedly is the great source of nourishment to vegetables, is capable of absorbing putrid effluvia more powerfully, or at least in much greater quantity, before it is saturated, than either the air or water. The practice of burying dead bodies is an undeniable proof of this. They are laid but a small depth under the ground; yet the abominable stench emitted by the carcase is retained in the earth, so that it never penetrates in such a manner as to be offensive. That earth may be saturated with this putrid matter, as well as air or water, is very certain; and, in case of such a saturation, no doubt either of these will take up the superfluous quantity, and become noxious; but unless the earth is fully saturated, both of them will deposit part of what they themselves contain in the earth, and by that means become more salutary than they were before.

10
Agreeable odour emitted by moist earth.

That earth is capable of attracting putrid effluvia from the air, perhaps, may not be so readily granted; and indeed we know of no experiment whereby it can be shown that putrid air is made salutary by having any kind of earth agitated in it: but if we consider the exceeding great salubrity of the air in the country, and the healthiness of those who follow the plough, or are employed in digging the ground, we must at least allow, that when the ground is turned up, it communicates no kind of noxious quality to the air; which it would certainly do, if it emitted a putrid effluvium. So far from this, the smell of moist earth is always agreeable and wholesome; and here we have the satisfaction to find our theory somewhat confirmed by the celebrated Baron van Swieten, late physician to the empress of Hungary.

"Physicians," says he, "usually advise their patients to rustication, not only that they may enjoy a pure and freely circulating air; but that, as their strength increases, they may, disengaged from all care, exercise their body by the slighter labours of agriculture, and other country amusements.

"There may perhaps be another cause why rustication will be of benefit to consumptions. It is well known, that, after some days drought, on the falling of rain that moistens the earth, there arises a grateful smell, which we are all sensible of; and this is commonly attributed to the vegetables, which before sapless, but now refreshed by rain, perspire more copiously. But Reaumur observed, that a like fragrancy is also perceptible after rain when the corn has been cut down in the fields, where there only remains dry stubble; and examining the matter more particularly, he found that dry earth is without smell, but as soon as it is moistened to the degree of having the consistence of softish pap, it then diffuses a strong smell; but if more water is added, the smell is diminished, nay even quite dissipated. Neither does it seem an easy matter to exhaust that power of producing smells which the earth is possessed of. Every day, during a fortnight, he made cakes of moistened earth; and having dried and wetted them over again, he could not perceive that the earth was less fragrant after all these repeated experiments, if it was again wetted. He further observed, that this fragrancy does not diffuse itself to any thing at a great distance, without being much diminished, and soon entirely gone.—It has been observed, that this expiration of the earth ceases if thunder and storms soon follow: while they continue, it begins to return; and when over, the same fragrancy of the earth for some hours affects the smell of a man as he walks along over a considerable tract of ground. There is no one, I believe, but has sometimes made this observation; and hence the earth, when moistened to a certain degree, seems to exhale fragrant odours, and indeed various in various places, as we are sensible of from their diversity. They are for the most part of a salubrious quality; as some persons quite faint and languid in the summer-heats perceive themselves wonderfully refreshed, whilst, after rain, they snuff up the fragrant odour. In some places those effluvia are perhaps bad, and may be the causes of diseases."

This property of emitting a fragrant smell is likewise taken notice of by Dr Home in his Principles of Agriculture and Vegetation. Some physicians have prescribed a bath of earth for the cure of consumptive patients; and Dr Solano de Luque was of opinion, that the earth had the property of absorbing contagious miasmata into it: but whether it can absorb these miasmata from living bodies or not, it certainly can absorb them from dead ones; for a piece of putrid meat will be much sweetened by lying for a short time in the ground.

11
Power of transmutation in the earth asserted.

From all this we cannot indeed infer, that putrid air is sweetened by mere earth; but we discover what is perhaps more important, namely, that though earth is the common receptacle of all putrid matters both animal and vegetable, there is a change made on them when in it, which cannot be made either by air or water. Thus, if the carcase of a small animal is left to putrefy in the air, it becomes exceedingly offensive, and continues so from first to last. The same thing happens if it is left to putrefy in water. But, in earth, the case is quite different. After the carcase is consumed, the earth which has imbibed all the putrid steams, instead of exhaling an offensive odour, diffuses an agreeable one; and thus we may see that it is endued with a power no less remarkable than that of at-

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traction or repulsion, and which we may distinguish by the name of *transmutation*. With regard to water, the case is more evident: for the most putrid water will be sweetened by percolation through earth, or even running in a channel for some time on its surface; but if it contains any impurities of the saline kind, they will not be separated, or at least in very small quantity.

12 Attraction insufficient to solve the phenomena of vegetation.

The existence of such a power as that of transmutation we will be obliged to own, whatever we imagine the vegetable food to consist of; for it is impossible to solve the phenomena of vegetation by attractions and repulsions. If we suppose the vegetable food to be salt, let us attack and repel salt as we will, it remains salt from first to last. Let us suppose it water, the case is the same; and, by mere attraction, nothing but masses of salt, or pools of water, could be produced. The case is the same on our own hypothesis; for, supposing plants composed of the putrid effluvia of others, and of dead animals, if nature was endued with no other power than attraction or repulsion, the vegetable would necessarily be a corrupted mass like that of which it was composed.—This power, as we have already seen, resides only in the earth, and in the vegetables themselves; air and water can indeed act as powerful solvents, but cannot transform or compound.

13 Confirmation of the above theory from the different operations of agriculture

We must next consider the nature of those different operations, which, from time immemorial, have been performed on the earth, in order to cause it produce the greatest crops of vegetables. If all of these shall be found conspiring to one general purpose, then the shortest and most easy method of attaining that purpose is undoubtedly the most proper to be practised in agriculture, whether it hath been as yet put in execution or not. These are,

14 Fallowing.

1. *Frequent ploughing, or fallowing*. The immediate consequences of this is to expose different quantities of the soil to the action of the air and sun, which will not fail to exert their solvent powers upon it. In consequence of this action, the earth is partly reduced to powder; many of the roots of vegetables, with which it always abounds, are dissolved and putrefied; and the earth produced from them mixes with the rest, as well as the effluvia they emit during their dissolution. The earth soon begins again to exert its prolific powers, and a crop of vegetables is produced. By a repetition of the ploughing, these are turned with their roots upwards, are exposed to the solvent powers of the air and light; in consequence of which they die, are putrefied, and more of the native soil is reduced to powder, and mixed with them. By a frequent repetition of this process, the soil becomes vastly more tender, and approaches to the nature of garden mould, and its fertility is considerably increased.

15 The capacity of a soil to retain water not increased by fallowing.

Lord Kames is of opinion, that the reason of the fertility of any soil being increased by fallowing, is, that its capacity of retaining water is increased. But this cannot be admitted; for so far from being more disposed to retain water by its pulverisation, the soil is evidently more disposed to part with it, either by evaporation, or by suffering the moisture to percolate thro' it. In this respect it is far inferior to clay; for though dry garden-mould absorbs water much more quickly than clay, it also dries much sooner, and thus all the advantage is lost.

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To those who reckon the food of vegetables to consist of oils or salts, the operation of fallowing ground must appear an useless one, as it can tend neither to produce oils nor salts, but to destroy them. As its utility, however, cannot be denied, the favourers of this theory imagine, that the ground, by repeated operations of this kind, is fitted for attracting the nitrous salts from the air: but it is found, that these salts cannot be attracted by earth, or any other substance, even when exposed for a great length of time to the air with a view to produce salt-petre; which gives a strong suspicion against their existence; and even if nitre is mixed with the soil, it is found to be detrimental, and will kill or poison plants instead of nourishing them. 16 Oils and salts not the true vegetable food.

2. *Overflowing the ground with water*.—This is found prodigiously to increase the fertility of any soil. It is well known how much Egypt owes to the annual overflowing of the Nile; and even in this country the overflowing of any ground is found to be attended with great advantage. This is practised by Mr Bakewell of Leicestershire, famous for his improvement in the breed of cattle; and he finds it fully to answer an annual manuring of any other sort. It is also recommended by Mr Anderson of Monkshill, in his Essays on Agriculture. 17 Overflowing the soil with water.

18 Reasons of the increase of fertility by the overflowing.

The fertilizing quality of water will easily be accounted for on the same principles. When grown vegetables are covered with water, their growth, however vigorous before, is immediately stopt, unless they be of the aquatic kind: they die, are dissolved, and putrefied; in which case, their finer parts are undoubtedly absorbed by the earth: and thus the *floating*, as it is called, of fields with water, answers the purpose of fallowing, with very little trouble. This is not all: for stagnating water always deposites a sediment, which mixing with the dissolved parts of the vegetables all over the field, forms an excellent manure; and when the water is allowed to run off, the heat of the sun soon brings the highest degree of putrefaction on the dead vegetables; the effluvia of which, mixing with the mud deposited from the water, makes it exceedingly rich.

19 Oils & salts cannot be the vegetable food.

Upon the supposition of oily and saline food for vegetables, this operation must certainly be prejudicial; for nothing can so effectually deprive any substance of salt as steeping it in water. Neither will water either deposit oil from itself, or suffer it to mix with the ground if accidentally brought to it; nay, though a field were previously impregnated with oil, upon overflowing it with water great part of the oil would be separated, and rise to the top: so that, in either case, this operation could not fail to impoverish land rather than enrich it; and as vegetables are found to be supplied with food in plenty by an operation which must undoubtedly tend to take away both oils and salts from them, we cannot help thinking this a demonstration, that their food is composed neither of oil nor salt.

20 Of manures and their operation.

3. *Manuring*, or mixing the soil with different substances.—We shall here confine ourselves to those which are of undoubted efficacy, and have their credit established by long experience. These are, 1. lime, chalk, marle, shells, or other earths, called by the chemists *calcareous earths*; 2. soot; 3. ashes; 4. dung of different kinds.—(1) The lime, chalk, marle, and shells, are all found to be of the same nature. The marle differs from the rest, only in having a mixture of clay along

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along with its calcareous part. These contain neither salt nor oil of any kind; they readily imbibe water, and as readily part with it. Quicklime, indeed, retains water very obstinately: but such lime as is laid upon the ground soon returns to the same state in which it originally was; and powdered limestone is found to answer as well for the purposes of manure as that which has been burnt; so that here we may consider them all as substances of the same class. If any of these substances are mixed with dead animal or vegetable bodies, they remarkably quicken their dissolution and corruption, as appears from Sir John Pringle's experiments on putrefaction. When mixed with the soil, therefore, they most undoubtedly exert their powers on such substances as they find there, in the same manner as they do on others; that is, they must hasten their dissolution and putrefaction, and give the pure vegetable mould an opportunity of absorbing their putrid steams, and consequently of being fertilized by it in the same manner as by putrid substances of any kind. (2.) Those who contend for oily and saline principles in the vegetable food, avail themselves of the usefulness of soot as a manure; which is not only oily of itself, but affords a great quantity of volatile salt, along with some neutral sal-ammoniac. It must be remembered, however, that not an atom either of volatile salt or sal-ammoniac can be extracted from soot without a considerable heat, which no soil can give, nor could any vegetable bear. Neither doth its oil appear without a great degree of heat: and though it feels somewhat unctuous to the touch, this is but a mere deception; for no true oil, capable of floating on water, can be obtained from soot without distillation. It is impossible, therefore, that soot can act upon the soil either as an oily or a saline substance; how far it is capable of dissolution by putrefaction, or being otherwise converted into an earth, hath not yet been determined by experiments; but as it yields, on distillation, the same principles which are obtained from animal or putrefied vegetable substances, it is probable that soot enriches the ground in the same manner that they do. (3.) The use of ashes in manure is likewise urged as an argument for the food of vegetables being of a saline nature; as it is known, that the common alkaline salts are procured by lixiviating the ashes of wood and other vegetables. Experience, however, shows us, that ashes are no less fit for manure after the salt is extracted from them than before. Indeed, if there be any difference, it is in favour of the washed ashes. The alkali itself, though in Sir John Pringle's experiments it was found to be *antiseptic*, or a resister of putrefaction, is nevertheless a powerful dissolvent; and as it must soon lose its alkaline properties when mixed with the earth, in consequence of the universal existence of the vitriolic acid, those substances which it has dissolved will be more disposed to putrefaction than before, and consequently tend to fertilize the ground in the manner we have already described. The washed ashes are *septics*, or promoters of putrefaction, and consequently act in the same manner as chalk or limestone. (4.) All kinds of dung are so much disposed to putrefaction, that it is difficult to imagine any other way in which they can be serviceable to vegetation than by their putrid effluvia.—People indeed may dream of imaginary salts in dung; but if they knew or considered the difficulty of procuring salt of any kind from dung, they would probably alter their sentiments. The volatile salts procured from this as well as other animal matters, are mere creatures of the fire: putrid urine produces them indeed without heat, but scarce any other animal substance. Nevertheless, other putrid substances will fertilize the ground as well as urine, and therefore must act in some other way than by their salts. Though Dr Priestly's experiments had never been made, we could have formed no other rational supposition concerning the manner in which putrid substances fertilize the earth, than what we have already done; but as he has shown that vegetables are prodigiously increased in bulk by the mere contact of these putrid streams, where no saline substances that could have access to them, we cannot help thinking this a decisive experiment concerning the manner in which the ground is fertilized by manuring with dung or other putrid substances.

21 Effects of saline substances on growing vegetables.

We shall conclude this part of the subject with an account of some experiments concerning the effects of saline substances on the growth of vegetables. The following are related by lord Kames, in his Gentleman Farmer.—A number of Jerusalem artichokes were set in pots filled with pure sand. One plant was kept as a standard, being nourished with water only. Other plants of the same kind were nourished with water in which salt of tartar, a fixed alkali, was dissolved. These grew more vigorously than the standard plant; but, by reiterated waterings, there came to be such an accumulation of the fixed alkali among the sand, as to make the plants decay, and at last to die. Some plants were nourished with water in which sal-ammoniac, a volatile alkali, was dissolved. These grew also well for some time; but, like the former, were destroyed by frequent reiterations of it. Weak lime-water promoted the growth of its plants more than common water. But water completely saturated with quicklime, proved more noxious than that which contained a fixed alkali, though less than that which contained a solution of volatile alkali.—Urine promoted, for a long time, the growth of its plants; and *the most putrid appeared to have the strongest effect*; but at last it totally destroy-them. *Water impregnated with putrid animal and vegetable substances, did more effectually promote the growth of its plants than any other solution; and in every stage of the process appeared to be salutary.*"

22 Common salt ineffectual as a manure.

With regard to other saline substances, there are not many experiments which can be depended upon concerning their qualities as manure. Mr Anderson relates an experiment made with common salt; the success of which, we apprehend, may justly enough be taken as a specimen of what is to be expected from manures of a similar kind.—He marked out a circle of six feet diameter in the middle of a grass-field, which he distinguished by driving a stake in its centre. All over this circle he strewed common salt, which, about the stake, lay near an inch thick on the ground. In this state he left it to the operations of nature. The grass sprung up as usual, neither better nor worse about the stake than in the rest of the field, and the place where the circle was could be distinguished only by the stake, which was left there for some years.

Upon these experiments we need make very few observations. They are so much in favour of our theory, that they seem made on purpose to confirm it. The fixed

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fixed alkali employed in Lord Kames's experiments would first exert its solvent powers on such heterogeneous substances as it met with among the sand: for no sand can be supposed to be perfectly free of these. As long as it exerted its strength on these only, the plant would thrive, for the reasons we have already mentioned; but having exhausted the small quantity of substances contained in the sand, it would next attack the plant itself, which consequently would decay and die. The same effects would necessarily follow in a greater degree from strong lime-water which contains lime in its caustic state; for this is a more powerful solvent than fixed alkali itself, and would not fail to destroy every thing it touched; nor is it at all improbable that the plant would seem to grow vigorously by the dissolution of part of its own roots, more nourishment being by this means given to those which remained sound. —Volatile alkali is likewise a powerful solvent: but, by reason of its volatility would exert its caustic power on the plant sooner than either lime or fixed alkali; and accordingly it seems to have been the most destructive of any thing that was tried. It seems owing to this, that putrid urine at last destroyed the plants whose growth it so long promoted; while water impregnated with other putrid matters, which yield no volatile alkali without heat, proved always salutary.

23
End to be kept in view by a farmer.

From all this, we may draw the following general conclusion, viz. That the principal end which a farmer ought to keep in view, is to impregnate his ground as much as possible, with substances which either actually contain putrid matter, or which are in their own nature *septic*, or promoters of putrefaction. To impregnate the air with putrid effluvia is impossible: and tho' it could be done, would be highly dangerous; for however salutary such effluvia may be to vegetables, nothing can be more fatal to mankind. The putrid substances, therefore, can only be used by mixing them with the earth; and in whatever manner they can be most perfectly, and in the greatest quantity, mixed with the soil, there the best crops may be expected.

Sect. III. *Of the different Soils, and the Manures most proper for each.*

24
Richest soils must at last be impoverished.

According to the theory we have just now laid down, the richest soil must be that which contains the greatest quantity of putrid matter, either animal or vegetable; and such is the earth into which animal and vegetable substances resolve themselves. Was this earth to be had in perfection, it is evident it could not stand in need of manure of any kind, or be the least enriched by it; for containing an immense quantity of putrid matter, it would freely communicate it to the vegetables planted in it, which would grow in the most luxuriant manner, without requiring any other care than that of keeping them constantly supplied with water. If we suppose the crop left upon the ground to putrefy and mix with the earth as before, the soil will contain the same quantity of putrid matter the second year that it did the first, and be equally prolific: but if the crop is removed to another place, and nothing is brought back to enrich the ground in its stead, it is evident, that it will contain less of the true vegetable food the second year than it did the first, and consequently be less prolific. For some time, however, the difference will not be perceptible; and people who are in possession of such ground may imagine that they enjoy a soil which will be perpetually fertile; but long experience has taught us, that the richest soils will at last be exhausted by repeated cropping without manure, as according to our theory they ought to be.

Where the ground has been suffered to remain uncultivated for many ages, producing all that time succulent plants which are easily putrefied, and trees, the leaves of which likewise contribute to enrich the ground by their falling off and mixing with it, the soil will in a manner be totally made up of pure vegetable earth, and be the richest, when cultivated, that can be imagined. This was the case with the lands of America. They had remained uncultivated perhaps since the creation, and were endowed with an extraordinary degree of fertility; it is nevertheless certain that such grounds as have been long cultivated, were so much exhausted, as to be not much better than the generality of cultivated grounds in France or England. Here, then, we have an example of one species of poor soil; namely, one that has been formerly very rich, but has been deprived, by repeated cropping, of great part of the vegetable food it contained. The farmer who is in possession of such ground, would no doubt willingly restore it to its former state; the present question is, What must be done in order to obtain this end? We have mentioned several kinds of manures which long practice has recommended as serviceable for improving ground: we shall suppose the farmer tries lime, or chalk; for, as we have already seen, their operations upon the soil must be precisely the same. This substance, being of a septic nature, will act upon such parts of the soil as are not putrefied, or but imperfectly so; in consequence of which, the farmer will reap a better crop than formerly. The septic nature of the lime is not altered by any length of time. In ploughing the ground, the lime is more and more perfectly mixed with it, and gradually exerts its power on every putrescible matter it touches. As long as any matter of this kind remains, the farmer will reap good crops: but when the putrescible matter is all exhausted, the ground then becomes perfectly barren; and the caustic qualities of the lime are more unjustly blamed for *burning* the ground, and reducing it to a *caput mortuum*; while it is plain, the lime has only done its office, and made the soil yield all that it was capable of yielding.

25
One species of poor soil destroyed by lime.

26
A species of poor soil meliorated by lime.

When the ground has been long uncultivated, producing all the time plants, not succulent, but such as are very difficultly dissolved, and in a manner incapable of putrefaction; there the soil will be excessively barren, and yield very scanty crops, tho' cultivated with the greatest care. Of this kind are those lands covered with heath, which are found to be the most barren of any, and the most difficultly brought to yield good crops. In this case lime will be as serviceable, as it was detrimental in the other: for by its septic qualities, it will continually reduce more and more of the soil to a putrid state; and thus there will be a constant succession of better and better crops, by the continued use of lime when the quantity first laid on has exerted all its force. By a continued use of this manure the gronnd will be gradually brought nearer and nearer to the nature of garden-mould; and, no doubt, by proper care, might be made

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made as good as any: but it will be as great a mistake to imagine, that, by the use of lime, this kind of soil may be rendered perpetually fertile, as to think that the other was naturally so; for though lime enriches this soil, it does so, not by adding vegetable food to it, but by preparing what it already contains; and when all is properly prepared, it must as certainly be exhausted as in the other case.

27 Poor soils, how restored.

Here, then, we have examples of two kinds of *poor* soils; one of which is totally destroyed, the other greatly improved, by lime, and which therefore require very different manures; lime being more proper for the last than dung; while dung, being more proper to restore an exhausted soil than lime, ought only to be used for the first. Besides dunging land which has been exhausted by long cropping, it is of great service to let it lie fallow for some time: for to this it owed its original fertility; and what gave the fertility originally cannot fail to restore it in some degree.

By attending to the distinction between the reasons for the poverty of the two soils just now mentioned, we will always be able to judge with certainty in what cases lime is to be used, and when dung is proper. The mere poverty of the soil is not a criterion whereby we can judge; we must consider what hath made it poor. If it is naturally so, we may almost infallibly conclude, that it will become better by being manured with lime. If it is *artificially* poor, or exhausted by continual cropping, we may conclude that lime will entirely destroy it.—We apprehend, that it is this *natural* kind of poverty only which Mr Anderson says in his Essays on Agriculture, may be remedied by lime; for we can scarce think that experience would direct any person to put lime upou land already exhausted. His words are,

28 Mr Anderson's opinion concerning lime.

"Calcareous matters act as powerfully upon land that is naturally poor, as upon land that is more richly impregnated with those substances that tend to produce a luxuriant vegetation."

"Writers on agriculture have long been in the custom of dividing manures into two classes, viz. *Enriching* manures, or those that tended directly to render the soil more prolific, however sterile it may be; among the foremost of which was dung: *Exciting* manures, or those that were supposed to have a tendency to render the soil more prolific, merely by acting upon those enriching manures that had been formerly in the soil, and giving them a new stimulus, so as to enable them to operate anew upon that soil which they had formerly fertilized. In which class of stimulating mannures, *lime* was always allowed to hold the foremost place.

"In consequence of this theory, it would follow, that lime could only be of use as a manure when applied to rich soils---and when applied to poor soils, would produce hardly any, or even perhaps hurtful, effects.

"I will frankly acknowledge, that I myself was so far imposed upon by the beauty of this theory, as to be hurried along with the general current of mankind, in the firm persuasion of the truth of this observation, and for many years did not sufficiently advert to those facts that were daily occuring to contradict this theory.---I am now, however, firmly convinced, from repeated observations, that lime, and other calcareous manures, produce a much greater *proportional* improvement upon poor soils than such as are richer.---And

3

that lime alone, upon a poor soil, will, in many cases, produce a much greater and more lasting degree of fertility than dung alone."

Thus far Mr Anderson's experience is exactly conformable to the theory we have laid down, and what ought to happen according to our principles. He mentions, however, some facts which seem very strongly to militate against it; and indeed he himself seems to proceed upon a theory altogether different.

"Calcareous matter alone (says he) is not capable of rearing plants to perfection;--- mould is necessary to be mixed with it in certain proportions, before it can form a proper soil. It remains, however, to be determined, what is the due proportion of these ingredients for forming a proper soil. 29 Query concerning the nature of a proper soil.

"We know that neither chalk, nor marle, nor lime, can be made to nourish plants alone; and soils are sometimes found that abound with the two first of these to a faulty degree. But the proportion of calcareous matter in these is so much larger than could ever be produced by art, where the soil was naturally destitute of these substances, that there seems to be no danger of erring on that side. Probably it would be much easier to correct the defects of these soils in which calcareous matters superabound, by driving earth upon them as a manure, than is generally imagined; as a very small proportion of it sometimes affords a very perfect soil. I shall illustrate my meaning by a few examples.

"Near Sandside, in the county of Caithness, there is a pretty extensive plain on the sea-coast, endowed with a most singular degree of fertility. In all seasons it produces a most luxuriant herbage, although it never got any manure since the creation; and has been for time immemorial subjected to the following course of crops. 30 Examples of soil perpetually fertile.

"1. Bear, after once ploughing from grass, usually a good crop.

"2. Bear, after once ploughing, a better crop than the first.

"3. Bear, after once ploughing, a crop equal to the first.

"4. 5. and 6. Natural grass, as close and rich as could be imagined, might be cut, if the possessor so inclined, and would yield an extraordinary crop of hay each year.

"After this the same course of cropping is renewed. The soil that admits of this singular mode of farming, appears to be a pure incoherent sand, destitute of the smallest particle of vegetable mould; but, upon examination, it is found to consist almost entirely of broken shells: the fine mould here bears such a small proportion to the calcareous matter, as to be scarce perceptible, and yet it forms the most fertile soil that ever I yet met with.

"I have seen many other links (downs) upon the sea-shore, which produced the most luxuriant herbage, and the closest and sweetest pile of grass, where they consisted of shelly sand; which, without doubt, derive their extraordinary fertility from that cause.

"A very remarkable plain is found in the island of Jir-eye, one of the Hebrides. It has been long employed as a common; so that it has never been disturbed by the plough, and affords annually the most luxuriant corp of herbage, consisting of white clover, and other

other valuable pasture-grasses, that can be met with any where. The soil consists of a very pure shelly sand.

"From these examples, I think it is evident, that a very small proportion of vegetable mould is sufficient to render calcareous matter a very rich soil. Perhaps, however, a larger proportion may be necessary when it is mixed with clay than with sand; as poor chalky soils seem to be of the nature of that composition.

To these examples brought by Mr Anderson, we may add some of the same kind mentioned by Lord Kames. His lordship having endeavoured to establish the theory of water being the only food of plants, tho' he himself frequently deviates from that theory, yet thinks it possible, upon such a principle, to make a soil perpetually fertile.

"To recruit (says he) with vegetable food, a soil impoverished by cropping, has hitherto been held the only object of agriculture. But here opens a grander object, worthy to employ our keenest industry, that of making a soil perpetually fertile. Such soils actually exist; and why should it be thought, that imitation here is above the reach of art? Many are the instances of nature being imitated with success. Let us not despair, while any hope remains; for invention never was exercised upon a subject of greater utility. The attempt may suggest proper experiments; it may open new views: and if we fail in equalling nature, may we not, however, hope to approach it? A soil perpetually fertile must be endowed with a power to retain moisture sufficient for its plants; and at the same time must be of a nature that does not harden by moisture. Calcareous earth promises to answer both ends: it prevents a soil from being hardened by water; and it may probably also invigorate its retentive quality. A field that got a sufficient dose of clay-marle, carried above 30 successive rich corps, without either dung or fallow. Doth not a soil so meliorated draw near to one perpetually fertile? Near the east side of Fife, the coast for a mile inward is covered with sea-sand, a foot depth or so; which is extremely fertile, by a mixture of sea-shells reduced to powder by attrition. The powdered shells, being the same with shell-marle, make the sand retentive of moisture; and yet no quantity of moisture will unite the sand into a solid body. A soil so mixed, seems to be not far distant from one perpetually fertile. These, it is true, are but faint essays; but what will not perseverance accomplish in a good cause?"

Having thus, in a manner, positively determined with Mr Anderson, that no dose of calcareous matter can possibly be too great, we cannot help owning ourselves surprised on finding his Lordship expressing him-

31 Inconsistency in Lord Kames's

self as follows: "An over-dose of shell-marle, laid perhaps an inch, and an inch and a half, or two inches thick, produces, for a time, large crops; but at last it renders the soil a *caput mortuum*, capable of neither corn nor grass; of which there are too many instances in Scotland; the same probably would follow from an over-dose of clay-marle, stone-marle, or pounded lime-stone."—To account for this, he is obliged to make a supposition directly contrary to his former one; namely, that calcareous matter renders the soil *incapable* of retaining water. This phenomenon, however, we think is solved upon the principles first laid down, in a satisfactory manner, and without the least inconsistency.

As to rendering soils perpetually fertile, we cannot help thinking the attempt altogether chemerical and vain. There is not one example in nature of a soil perpetually fertile, where it has no supply but from the air, and the rain which falls upon it. The above recited examples can by no means, be admitted as proofs of perpetual fertility. We know, that the grass on the banks of a river is much more luxuriant than what grows at a distance; the reason is, that the water is attracted by the earth, and communicates its fertilizing qualities to it; but was the river to be dried up the grass would soon become like the rest. Why should not the ocean have the same power of fertilizing plains near its shores, that rivers have of fertilizing small spots near their banks? We see, however, that it hath not; for the sea-shores are generally sandy and barren. The reason of this is, that the waters of the ocean contain a quantity of loose acid*; and this acid is poisonous to plants; but abstracting this acid part, we hesitate not to affirm, that sea-water is more fertilizing than river-water. It is impossible to know how far the waters of the ocean penetrate under ground through a sandy soil. Where they meet with nothing to absorb their acid, there the ground is quite barren; but in passing through an immense quantity of broken shells, the calcareous matter we are very certain, will absorb all the acid; and thus the soil will be continually benefited by its vicinity to the ocean. All the above fields, therefore, are evidently supplied with nourishment from the ocean: for if the salt-water has sufficient efficacy to render fields which are in its neighbourhood barren, why should it not render them fertile when the cause of barrenness is removed from its waters?

32 Perpetual fertility of soils chimerical.

* See *Water*.

After all, the field in Caithness, mentioned by Mr Anderson, seems to have been perpetually fertile only in grass; for though the second year it carried a better crop of bear than it did the first, yet the third year the crop was worse than the second, and only equal to the first. Had it been ploughed a fourth time, the crop would probably have been worse than the first. Ground is not near so much exhausted by grass as corn, even though the crop be cut, and carried off; and still less, if it only feeds cattle, and is manured by their dung; which appears to have been the case with this field. Lord Kames, indeed, mentions fields in Scotland, that, past memory, have carried successive crops of wheat, pease, barley, oats, without a fallow, and without a manure; and particularises one on the river Carron, of nine or ten acres, which had carried 103 corps of oats without intermission, and without manure: but as we are not acquainted with any such fields, nor know any thing about their particular situation, we can form no judgement concerning them.

33 Clay and sandy soils.

Besides the two kinds of soils abovementioned, there are others, the principal ingredient of which is clay or sand. The first of these is apt to be hardened by the heat of the sun, so that the vegetables can scarce penetrate it in such a manner as to receive proper nourishment. The second, if it is not situated so as to receive a great deal of moisture, is very apt to be parched up in summer, and the crop destroyed; nor has it sufficient adhesion to support plants that have few roots and grow high. From these opposite qualities, it is evident, that these two soils would be a proper manure for one another: the clay would give a sufficient degree of firmness to the sand, and the sand would break the

the too great tenacity of the clay. According to Dr Home's experiments, however, sand is the worst manure for clay that can be used. He recommends marle most. To reduce clay-ground as near as possible to the form of pure vegetable mould, it must first be pulverized. This is most effectually performed by ploughing and harrowing; but care must be taken not to plough it whilst too wet, otherwise it will concrete into hard clots which can scarcely be broken. After it is pulverized, however, some means must be taken to keep it from concreting again into the same hard masses as before. According to Lord Kames, though clay, after pulverization, will concrete into as hard a mass as before, if mixed with water; yet if mixed with dunghill juice, it will not concrete any more. Lime also breaks its tenacity, and is very useful as a manure for this kind of soil.

54
Fertility of the earth limited.

The conclusion we wish the practical farmer to draw from our theory is, That there is a certain limit to the fertility of the earth, both as to duration and to degree, at any particular time: that the nearer any soil approaches to the nature of pure garden-mould, the nearer it is to the most perfect degree of fertility; but that there are no hopes of keeping it perpetually in such a state, or in any degree of approximation to it, but by constant and regular manuring with dung. Lime, chalk, marle, &c. may be proper to bring it near to this state, but are absolutely unfit to keep it continually so. They may indeed for several years produce large corps; but the more they increase the fertility for some years, the sooner will they bring on an absolute barrenness; while regular manuring with plenty of dung will always ensure the keeping up the soil in good condition, without any occasion for fallow. What we have said concerning the use of lime, &c. applies likewise to the practice of frequent ploughing, though in a less degree. This tends to meliorate ground that is naturally poor, by giving an opportunity to the vegetable parts to putrefy; but when that is done, it tends to exhaust though not so much as lime. A judicious farmer will constantly strive to keep his lands always in good condition, rather than to make them suddenly much better; lest a few years should convince him that he was in reality doing almost irreparable mischief, while he fancied himself making improvements. As for the ridiculous notions of stimulating the ground by saline manures, we hope they will never enter the brain of any rational practitioner of agriculture.

Sect. IV. *Of the different kinds of Vegetables proper to be raised with a view to the Melioration of Soil.*

35
Soil pulverized by certain vegetables.

The methods of meliorating soils, which we have mentioned above, consisting of tedious and laborious operations that yield no return at first, it is natural for a farmer to wish for some method of meliorating his ground, and reaping crops at the same time. One very considerable step towards the melioration of ground is, its pulverization. This is accomplished by repeated ploughings (A), as already mentioned; especially if performed in autumn, that the ground may be exposed to the winter's frost; but these ploughings yield no crop as long as the field is not sown. By planting in the field, however, those vegetables whose roots swell to a considerable bulk, the ground must be constantly acted upon by the swelling of their roots in all directions; and thus the growing of the crop itself may be equal, or superior, in efficacy to several ploughings, at the same time that the farmer enjoys the benefit of it. The plant most remarkable for the swelling of its roots is the potato; and by none is the ground meliorated more, or even so much. They are not, however, equally proper for all soils. In clay they do not thrive, nor are palatable; but in hard gravelly or sandy soils, they grow to a large size, and are of an excellent quality. Turnips likewise contribute to meliorate the ground, by the swelling of their roots, though not so much as potatoes. They have this advantage, however, that they thrive in almost any soil. In clay ground, peas and beans thrive exceedingly well, and therefore are proper in this kind of soil as a preparatory for other kinds of grain. These push their roots deep into the ground, and cover it with their leaves more than other crops; so that the sun has not so much access as when it is covered with other kinds of grain. Wherever any of these kinds of vegetables are raised, it is observeable, that more or less blackness is communicated to the soil: an evident sign of its melioration; this being the colour of the true vegetable mould, or *loamy soil*, as it is called.

Besides the abovementioned plants, carrots, parsnips, cabbages, and all those vegetables which sink their roots deep in the ground, answer the same purpose of loosening and pulverising the earth; but as they will not thrive but on ground already well cultivated, they cannot be raised to any advantage for the purpose of meliorating a poor soil.

It hath been customary in many places, particularly in England, to sow turnips, pease, buck-wheat, &c. and then to plough them down for manuring the land. This being similar to that operation of nature by which she renders the uncultivated soils so exceedingly fertile, cannot fail of being attended with singular advantages; and might be looked upon as preferable even to driving dung on the land to fatten it, was it not attended with the entire loss of a crop for that year.

Sect. V. *Of destroying Weeds.*

What we have already said regarding the cultivation of the soil, respects only the fitting of it for producing all kinds of vegetables indiscriminately. Experience, however, shows, that the ground is naturally much more disposed to produce and nourish some kinds of vegetables than others; and those which the earth seems most to delight in, are commonly such as are of very little use to man; but if neglected, will increase to such a degree, as entirely to destroy the plants intended to be raised, or at least hinder them from coming to perfection, by depriving them of nourishment. The clearing the ground of weeds, therefore, is an article no less necessary in agriculture, than the disposing it to produce vegetables of any kind in plenty.

(A) This, however, must be understood with some limitation: for it appears from experience, that many *light* and *thin* soils receive detriment rather than advantage from frequent ploughings; particularly in summer when the sun exhales the nutritive particles in great abundance.

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36 Weeds divided into annual and perennial.

The weeds may be divided, according to the time of their duration, into *annual*, or such as spring from a seed, and die the same year; and *perennial*, that is, such as are propagated by the roots, and last for a number of years. The first kind are the least noxious, and most easily destroyed. For this purpose it will be sufficient to let them spring up till near the time of ripening their seed, and then plough them down before it comes to maturity. It is also of service to destroy such weeds as grow in borders, or neglected corners, and frequently scatter their seeds to a great distance; such as the thistle, dandelion, rag-weed, &c. for these are sufficient to propagate their species through a deal of ground; as their seeds are carried about with the wind to very considerable distances. A farmer ought also to take care, that the small seeds of weeds, separated from corn in winnowing, be not sown again upon the ground; for this certainly happens when they are thrown upon a dunghill; because, being the natural offspring of the earth, they are not easily destroyed. The best method of preventing any mischief from this cause, would be to burn them.

37 Perennial weeds, how destroyed.

Perennial weeds cannot be effectually destroyed, but by removing the roots from the ground, which is often a matter of some difficulty. Many of these roots strike so deep in the ground, that they can scarcely be got out. The only method that can be depended upon in this case, is frequent ploughing, to render the ground as tender as possible; and harrowing with a particular kind of harrow, which shall hereafter be described, in order to collect these pernicious roots. When collected, they ought to be dried and burnt, as the only effectual method of insuring their doing no further mischief.

There is a particular species of weed, peculiar only to grass-lands, of a soft spongy nature, called *fog*, which it is found very difficult to exterminate. Where the land can be conveniently tilled, this weed may be destroyed by covering it with a crop of pease, potatoes, &c. or, passing a heavy roller over the ground will be of great service; for fog owes its origin to too great a laxity of the soil, and will not grow upon firm ground.

38 Broom, furze, &c. how destroyed.

Besides these kinds of weeds which are of an herbaceous nature, there are others which are woody, and grow to a very considerable size; such as broom, furze or whins, and thorns. *Broom* is an evergreen shrub, that thrives best in sandy soil; and there it grows so vigorously, as scarce to admit any grass under it. It propagates by seed which grows in pods; and these, when fully ripe, break with violence, scattering the seeds all around. Thus, a field which is overgrown with broom, besides the old plants, always contains an infinite number of young ones; so that though the old plants die when cut over, a fresh crop constantly springs up. It may, however, be destroyed by frequent ploughing and harrowing, in the same manner as other perennial weeds are; for it does not for some time carry any seed, and the frequent ploughing encourages the vegetation of all those that are already in the ground, which cannot fail of being destroyed by frequent repetitions of the operation. Another method of destroying broom, is by pasturing the field where it grows with sheep. A few of the old bushes may be left as a shelter, and these will be in a good measure prevented from spreading by the cropping of the sheep. These animals are very fond of broom, and greedily devour every young shoot; so that if any remain after the first year, there will not be a vestige the second. If this method of extirpating broom is equally effectual with that of frequent ploughing, it is certainly much more profitable, as there is no food more nourishing to sheep than young broom. Broom, however, is said to have a singular effect upon sheep: it makes them drunk so effectually, that when heated with a little driving, they tumble over, and lie without motion.

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The *whin* is a fine evergreen shrub, carrying a sweet-smelling flower all the year round. It propagates both by seed and by its roots, which spread sometimes to the distance of 10 or 12 feet; and hence, when once established, it is with difficulty extirpated. The best method is to set fire to the whins in frosty weather; for frost has the effect to wither whins, and make them burn readily. The stumps must then be cut over with a hatchet; and when the ground is well softened by rain, it may be ploughed up, and the roots taken out by a harrow adapted to that purpose. If the field is soon laid down to grass, the whins will again spring up in great abundance, from the seeds, and small parts of the roots left in the ground. In this case, pasturing with sheep is an effectual remedy; as they are no less fond of young whins than of young broom; and if there are a sufficient number, they will not leave a single plant above ground. But if grass is not immediately wanted, the most effectual method of clearing a field of whins, is by reiterated ploughings.

The *thorn*, or *bramble*, spreads its roots very wide, and at the same time sinks them deep in the earth. Though cut in the winter, it rises, and comes to such perfection as to carry fruit in summer. It can only be extirpated by ploughing up the ground, and collecting the roots.

Sect. VI. *Of the most proper kinds of Vegetables to be raised for the purposes of feeding Cattle.*

Though this must be an article of the utmost consequence to every farmer, we do not find that it has been much considered. Mr Anderson seems to have been the first writer on agriculture who hath properly attended to this subject; and what he hath wrote upon it, rather a catalogue of desiderata, than any thing else: and indeed the desiderata on this subject are so many and so great, that we must acknowledge ourselves very unable to fill them up.—To attain to a competent knowledge in this respect, the following things must be taken into consideration. (1.) The wholesomeness of the food for cattle, with regard to health and strength, or fatness. (2) The quantity that any extent of ground is capable of yielding. (3.) The quantity necessary to feed the different kinds of cattle. (4.) The labour of cultivation; and, (5) The soil they require to bring them to perfection, and the effect they have upon it. 39

39 Qualities of the food requisite for cattle.

With regard to the wholesomeness, it is plain, that as the natural food of wild cattle is the green succulent plants they meet with all the year round, food of this kind, could it be had, must be preferable to hay; and accordingly we find that cattle will always prefer succulent vegetables where they can get them. To find plants

plants of this kind, and having proper qualities in other respects, we must search among those which continue green all the year round, or come to their greatest perfection in the winter time.—Of these, cabbages bid fair for holding the first place; both as being very succulent, and a very large quantity of them growing upon a small space of ground. In Mr Young's Six Months Tour, we have an account of the produce of cabbages in many different places, and on a variety of soils. The produce by Mr Crow at Keplin, on a clay soil, was, on an average of six years, 35 ton per acre; by Mr Smelt at the Leases, on a sandy gravel, 38 tons per acre; by Mr Scroop at Danby, on an average of six years, 37 tons per acre: and the general average of all the accounts given by Mr Young, is 36 tons per acre.

40 Cabbages, their properties.

Cabbages, however, have the great inconveniency of sometimes imparting a disagreeable flavour to the milk of cows fed with them, and even to the flesh of other cattle. This, it is said, may be prevented by carefully picking off the decayed and withered leaves: and very probably this is the case; for no vegetable inclines more to putrefaction than this; and therefore particular care ought to be taken to pull off all the leaves that have any symptoms of decay. Dr Priestley found that air was rendered noxious by a cabbage-leaf remaining in it for one night, though the leaf did not show any symptom of putrefaction.—For milk-cows, probably the cabbages might be rendered more proper food by boiling them.

41 Air rendered noxious by them.

42 Turnip-rooted cabbage.

The culture of the turnip-rooted cabbage has lately been much practised, and greatly recommended, particularly for the purpose of a late spring feed; and seems indeed to be a most important article in the farming œconomy, as will be shown in its proper place.

43 Turnips.

Turnips likewise produce very bulky crops, though far inferior to those of cabbages. According to Mr Young's calculation, the finest soil does not produce above five tons of turnips per acre; which is indeed a very great disproportion: but possibly such a quantity of turnips may not be consumed by cattle as of cabbages; an ox, of 80 stone weight, eat 210 lb. of cabbages in 24 hours, besides seven pound of hay.

44 Carrots.

Carrots are found to be an excellent food for cattle of all kinds, and are greatly relished by them. In a rich sand, according to Mr Young's account, the produce of this root was 200 bushels per acre. In a finer soil, it was 640 bushels per acre. A lean hog was fatted by carrots in ten days time: he eat 196 lb.; and his fat was very fine, white, firm, and did not boil away in the dressing. They were preferred to turnips by the cattle; which having tasted the carrots, soon became so fond of them, as difficultly to be made to eat the turnips at all. It is probable, indeed, that carrots will make a more wholesome food for cattle than either cabbages or turnips, as they are strongly antiseptic; insomuch as to be used in poultices for correcting the sanies of cancers. It is probably owing to this, that the milk of cows fed on carrots is never found to have any bad taste. Six horses kept on them thro' the winter without oats, performed their work as usual, and looked equally well. This may be looked upon as a proof of their salubrity as a food; and it certainly can be no detriment to a farmer to be so much versant in medical matters, as to know the impropriety of giving putrescent food to his cattle. It is well known, what a prodigious difference there is in the health of the human species when fed on putrid meats, in comparison of what they enjoy when supplied with food of a contrary nature; and why may there not be a difference in the health of beasts, as well as of men, when in similar circumstances?—It is also very probable, that as carrots are more solid than cabbages or turnips, they will go much farther in feeding cattle than either of them. The abovementioned example of the hog seems some kind of confirmation of this; he being fed, for ten days together, with 21 lb. less weight of carrots than what an ox devoured of cabbages and hay in one day. There is a great disproportion, it must be owned, between the bulk of an ox and that of a hog; but we can scarce think that an ox will eat as much at a time as ten hogs. At Parlington in Yorkshire, 20 work horses, four bullocks, and six milk-cows, were fed on the carrots that grew on three acres, from the end of September till the beginning of May; and the animals never tasted any other food but a little hay. The milk was excellent, and 30 hogs were fattened upon what was left by the other cattle.

45 Potatoes.

Potatoes likewise appear to be a very palatable food for all kinds of cattle; and not only oxen, hogs, &c. are easily fed by them, but even poultry. The cheapness of potatoes compared with other kinds of food for cattle, cannot well be known, as, besides the advantage of the crop, they improve the ground more than any other known vegetable. According to a correspondent of the Bath Society*, "roasting pork is never so moist and delicate as when fed with potatoes, and killed from the barn-door without any confinement. For bacon and hams, two bushels of pea-meal should be well incorporated with four bushels of boiled potatoes, which quantity will fat a hog of twelve stone (fourteen pounds to the stone). Cows are particularly fond of them: half a bushel at night, and the same proportion in the morning, with a small quantity of hay, is sufficient to keep three cows in full milk; they will yield as much and as sweet butter as the best grass. In fattening cattle, I allow them all they will eat: a beast of about 35 stone will require a bushel per day, but will fatten one-third sooner than on turnips. The potatoes should be clean washed, and not given until they are dry. They do not require boiling for any purpose but fattening hogs for bacon, or poultry; the latter eat them greedily. I prefer the champion potato to any sort I ever cultivated. They do not answer so well for horses and colts as I expected (at least they have not with me), though some other gentlemen have approved of them as substitutes for oats."

* *Letters and Papers on Agriculture*, &c. vol. iii. art. 16.

The abovementioned vegetables have all of them the property of meliorating, rather than exhausting the soil; and this is certainly a very valuable qualification: but carrots and cabbages will not thrive except in soils that are already well cultivated; while potatoes and turnips may be used as the first crops of a soil with great advantage. In this respect, they are greatly superior to the others; as it may be disagreeable to take up the best grounds of a farm with plants designed only for food to cattle.

46 Buck-wheat.

Buck-wheat (*Polygonum fagopyrum*) has been lately recommended as an useful article in the present as well as other respects. It has been chiefly applied to the

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feeding hogs, and esteemed equal in value to barley; it is much more easily ground than barley, as a malt-mill will grind it completely. Horses are very fond of the grain; poultry of all sorts are speedily fattened by it; and the bottom of the plant affords food for bees at a very opportune season of the year, when the meadows and trees are mostly stripped of their flowers. Probably the grain may hereafter be even found a material article in distillation, should a sufficient quantity be raised with that view. From the success of some experiments detailed in the Bath Society papers, and for which a premium was bestowed, it has been inferred, that this article ought in numerous cases to supercede the practice of summer-fallowing.

47 Whins an excellent food for horses.

Whins have lately been recommended as a very proper food for cattle, especially horses; and are recommended by Mr Anderson in a particular manner. They have this advantage, that they require no culture, and grow on the very worst soil; but they are troublesome to cut, and require to be bruised in a mill constructed for this purpose; neither is the ground at all meliorated by letting whins grow upon it for any length of time. Notwithstanding these disadvantages, however, as whins continue green all the year round, and when bruised will afford an excellent succulent food, which seems possessed of strongly invigorating qualities, they may be looked upon as the cheapest winter-food that can possibly be given to cattle. According to the calculations of Mr Eddison of Gateford, a single acre, well cropped with whims, will winter six horses: at three or four years growth, the whole crop should be taken, cut close to the ground, and carried to the mill; in which the whins are to be bruised, and then given to the horses. Four acres ought to be planted, that one may be used each year, at the proper age to be cut; and he reckons the labour of one man sufficient for providing food to this number of horses. He says they all prefer the whins to hay or even to corn.

48 Burnet.

The herb called *burnet* hath likewise been recommended as proper food for cattle, on account of its being an evergreen; and further recommended, by growing almost as fast in winter as in summer. Of this herb, however, we have very various accounts. In a letter addressed by Sir James Caldwell, F. R. S. to the Dublin Society, the culture of this plant is strongly recommended on the authority of one Bartholomew Rocque, farmer at Walham-Green, a village about three miles south-west of London.

49 Recommended by Sir James Caldwell.

What gave occasion to the recommendation of this plant, was, that about the year 1760, Mr Wych, chairman of the committee of Agriculture of the London Society for the encouragement of arts, manufactures, and commerce, came to Rocque (who was become very eminent by the premiums he had received from the society), and told him, he had been thinking, that as there are many animals which subsist wholly upon the fruits of the earth, there must certainly be some plant or herb fit for them that naturally vegetates in winter; otherwise we must believe the Creator, infinitely wise and good, to have made creatures without providing for their subsistence; and that if there had been no such plants or herbs, many species of animals would have perished before we took them out of the hands of nature, and provided for them dry meat at a season, when, indigenous plants having been indiscriminately excluded, under the name of weeds, from cultivated fields and places set apart for natural grass, green or fresh meat was no longer to be found.

Rocque allowed the force of this reasoning; but said, the knowledge of a grass, or artificial pasture, that would vegetate in winter, and produce green fodder for cattle, was lost; at least, that he knew of no such plant.—Mr Wych, however, knowing how very great the advantage would be of discovering a green fodder for winter and early in the spring, wrote to Berne, and also to some considerable places in Sweden, stating the same argument, and asking the same question. His answers to these letters were the same that had been given by Rocque. They owned there must be such a plant, but declared they did not know it.

Mr Wych then applied again to Rocque; and desired him to search for the plant so much desired, and so certainly existing. Rocque set about this search with great assiduity; and finding that a pimpernel, called *burnet*, was of very speedy growth, and grew near as fast in winter as in summer, he took a handful of it and carried it into his stable, where there were five horses; every one of which eat it with the greatest eagerness snatching it even without first smelling it. Upon the success of this experiment he went to London, and bought all the burnet-seed he could get, amounting to no more than eight pounds, it having been only used in salads; and he paid for it at the rate of 4s. a pound. Six of the eight pounds of seed he sewed upon half an acre of ground, in March, in the year 1761, with a quarter of a peck of spring-wheat, both by hand. The seed being very bad, it came up but thin. However, he sowed the other two pounds in the beginning of June, upon about six rood of ground: this he mowed in the beginning of August; and at Michaelmas he planted off the plants on about 20 rood of ground, giving each plant a foot every way, and taking care not to bury the heart. These plants bore two crops of seed the year following; the first about the middle of June, the second about the middle of September; but the June crop was the best. The year after, it grew very rank, and produced two crops of seed, both very good. As it ought not to be cut after September, he let it stand till the next year; when it sheltered itself, and grew very well during all the winter, except when there was a hard frost; and even during the frost it continued green, though it was not perceived to grow. In the March following it covered the ground very well, and was fit to receive cattle.

If the winter is not remarkably severe, the burnet, though cut in September, will be 18 inches long in March; and it may be fed from the beginning of February till May: if the cattle are taken off in May, there will be a good crop of seed in the beginning of July. Five weeks after the cattle are taken off, it may be removed, if that is preferred to its standing for seed; it grows at the rate of an inch a-day, and is made into hay like other grass. It may be mown three times in one summer, and should be cut just before it begins to flower. Six rood of ground has produced 1150 pounds at the first cutting of the third year after it was sowed; and, in autumn 1763, Rocque sold no less than 300 bushels of the feed.

According to Rocque, the soil in which burnet flourishes best, is a dry gravel; the longest drought never hurts

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hurts it: and Sir James Caldwell asserts, that he saw a very vigorous and exuberant plant of this kind, growing from between two bricks in a wall in Rocque's ground, without any communication with the soil; for he had cut away all the fibres of the root that had stretched downward, and penetrated the earth, long before.

Burnet was found equally fit for feeding cows, sheep, and horses; but the sheep must not be suffered to crop it too close. Though no seed was left among the hay, yet it proved nourishing food: and Roque kept a horse, upon nothing else, who, at the time of writing the account, was in good heart, and looked well. He affirmed also, that it cured horses of the distemper called the *grease*, and that by its means he cured one which was thought incurable; but says, it is only the first crop which has this effect.

This is the substance of Sir James Caldwell's letter to the Dublin Society, at least as to what regards the culture of Burnet; and it might reasonably be expected, that a plant, whose use was recommended to the

30 Burnet reckoned an improper food by Mr Miller and Mr Anderson.

public with so much parade, would soon have come into universal esteem. We are surprised therefore, on looking into Mr Miller's Dictionary, to find the following words, under the article *Poterium*:—"This plant has of late been recommended by *persons of little skill*, to be sown as a winter pabulum for cattle: but whoever will give themselves the trouble to examine the grounds where it naturally grows, will find the plants left uneaten by the cattle, when the grass about them has been cropped to the roots; besides, in wet winters, and in strong land, the plants are of short duration, and therefore very unfit for that purpose: nor is the produce sufficient to tempt any person of skill to engage in its culture; therefore I wish those persons to make trial of it in small quantities, before they embark largely in these new schemes."—Mr Anderson, too, in his Essays on Agriculure, mentions the produce of burnet being so small, as not to be worth cultivating.

51 White beet recommended.

Upon the authority of Mr Rocque, likewise, the white beet is recommended as a most excellent food for cows; that it vegetates during the whole winter, consequently is very forward in the spring: and that the most profitable way of feeding cows is, to mow this herb, and give it to them green all the summer. It grew in Rocque's garden, during a very great drought, no less than four feet high, from the 30th of May to the 3d of July; which is no more than one month and four days. In summer it grows more than an inch a-day, and is best sown in March: a bushel is enough for an acre, and will not cost more than ten shillings. It thrives best in a rich, deep, light soil: the stalks are very thick and succulent; the cows should therefore eat them green.

52 Root of scarcity.

Another species of beet (*Beta cicla*), the Mangel Wurzel, or *Root of Scarcity*, as it has been called, has been lately extolled as food for both man and cattle, but, after all, seems only to deserve attention in the latter view. It is a biennial plant; the root is large and fleshy, sometimes a foot in diameter. It rises above the ground several inches, is thickest at the top, tapering gradually downward. The roots are of various colours, white, yellow, and red; but these last are always of a much paler colour than beetrave. It is good fodder for cows, and does not communicate any taste to the milk. It produces great abundance of leaves in summer, which may be cut three or four times without injuring the plant. The leaves are more palatable to cattle than most other garden plants, and are found to be very wholesome. The farmers in those parts of Germany where it is chiefly cultivated, we are told, prefer this species of beet, for feeding cattle, to cabbages, principally because they are not so liable to be hurt by worms or insects; but they think they are not so nourishing as turnips, potatoes, or carrots, and that cattle are not nearly so soon fattened by this root as by carrots, parsnips, or cabbages. It has even been asserted, that this root affords less nourishment than any of those that have been commonly employed for feeding cattle. This does not correspond with the pompous accounts with which the public have been entertained. Upon the whole, however, it is a plant which seems to deserve the attention of farmers; as on some soils, and in particular circumstances, it may prove a very useful article for the above purposes.

54 Sheep's fescue grass.

In Mr Anderson's essays, we find it recommended to make trial of some kinds of grasses, which probably would not only answer for fresh fodder during the winter, but might also be cut for hay in summer. This is particularly the case with that species called *sheep's fescue grass*. "I had (says he) a small patch of this grass in winter 1773; which, having been cut in the month of August or September preceding, was saved from that period, and had advanced before winter to the length of five or six inches; forming the closest pile that could be imagined. And although we had about six weeks of very intense frost, with snow; and about other six weeks, immediately succeeding that, of exceeding keen frost every night, with frequent thaws in the day-time, without any snow, during which time almost every green thing was destroyed; yet this little patch continued all along to retain as fine a verdure as any meadow in the month of May; hardly a point of a leaf having been withered by the uncommon severity of the weather. And as this grass begins to vegetate very early in the spring, I leave the reader to judge what might be the value of a field of grass of this kind in these circumstauces."

Of another kind of grass, called *purple fescue*, Mr Anderson gives the following character. "It retained its verdure much better than rye-grass during the winter-season: but it had more of its points killed by the weather than the former. It likewise rises in the spring, at least as early as rye-grass." 54 Purple fescue.

This ingenious farmer has also made experiments on the culture of these and several other kinds of grasses; which being very well worthy of attention, we shall here insert.

1. *Purple fescue-grass.* "Although this grass is very often found in old pastures, yet it has but a few flower-stalks, and as it is greedily eat by all domestic animals, these are seldom suffered to appear; so that it usually remains there unperceived. But it seems to be better able to endure the peculiar acrimony of the dung of dogs than almost any other plant; and is therefore often to be met with in *dog-hills*, as I call the little hills by road-sides where dogs usually piss and dung: and as it is allowed to grow there undisturbed, the farmer may have an opportunity of examining the plant, and becoming acquainted with its appearance.

"The leaves are long and small, and appear to be roundish,

roundish, something like a wire; but, upon examination, they are found not to be tubulated like a reed or rush: the sides of the leaf being only folded together from the middle rib, exactly like the strong bent-grass on the sea shore. The flower stalk is small, and branches out in the head, a little resembling the wild-oat; only the grains are much smaller, and the ear does not spread full open, but lies bending a little to one side. The stalks are often spotted with reddish freckles, and the tops of the roots are usually tinged with the same colour; from whence it has probably obtained its distinctive name of *Festuca rubra*, or *red (purple) fescue*.

"It is often to be met with in old garden-walks; and as its leaves advance very quickly after cutting, it may usually be discovered above the other grasses, about a week or fortnight after the walks are cut. Nor do they seem to advance only at one season, and then stop and decay, like the rye-grass; but continue to advance during the whole of the summer, even where they are not cut; so that they sometimes attain a very great length. Last season, (1774,) I measured a leaf of this grass, that sprung up in a neglected corner, which was four feet and four inches in length, although not thicker than a small wire. It is unnecessary to add, that these leaves naturally trail upon the ground, unless where they meet with some accidental support; and that if any quantity of it is suffered to grow for a whole season, without being eat down or cut, the roots of the leaves are almost rotted, by the overshadowing of the tops of the other leaves, before the end of the season.

55 Appearance in its cultivated state.

This is the appearance and condition of the plant in its native situation; as it is seldom that it is discovered but in pretty old pastures, and as in that state it carries only a very few seed-stalks, it was with some difficulty that I could collect a small handful of the seed, which I carefully sowed in a small patch of garden-mould, to try if it could be easily cultivated. It came up as quickly as any other kind of grass, but was at first as small as hairs: the leaves, however, advanced apace; and were, before autumn, when the grain with which they had been sowed was cut down, about 16 or 18 inches in length: but having been sown very thin, it was necessary to pick out some other kinds of grass that came up amongst it, lest it might have been choaked by them. Early next spring it advanced with prodigious vigour, and the tufts that were formed from every seed became exceeding large; so that it quickly filled the whole ground. But now the leaves were almost as broad as those of common rye-grass, and the two sides only inclined a little towards one another from the mid-rib, without any appearance of roundness. In due time a great many seed-stalks sprung out, which attained very nearly to the height of four feet, and produced seeds in abundance; which may be as easily saved as those of common rye-grass.

"The prodigious difference between this plant in its native and cultivated state amazed me; but it was with a good deal of satisfaction that I found there would be no difficulty of procuring seeds from it, which I had much doubted of at first. It would seem, that nature hath endowed this plant with a strong generative power during its youth, which it gradually loses as it advances in age (for the difference perceived in this case could not be attributed to the richness of the soil); and that, on the contrary, when it was old, the leaves advanced with an additional vigour, in proportion to the declining strength of the flower-stalks: for the leaves of the young plant seldom exceed two feet, whereas numbers of the old leaves were near four feet in length.

"From these peculiarities in the growth of this plant, it would seem to promise to be of great use to the farmer; as he could reap from a field of it, for the first two or three years, as great a weight of hay as he could obtain from any of the culmiferous grasses (these bearing a long jointed stalk); and, if he meant afterwards to pasture it, he would suffer no inconveniences from the flower-stalks; and the succulent leaves that continue to vegetate during the whole summer, would at all times furnish his cattle with abundance of wholesome food. It has also been remarked, that this grass rises as early in the spring as rye-grass; and continues green for the greatest part of winter, which the other does not. It is moreover an abiding plant, as it seems never to wear out of the ground where it has once been established. On all which accounts, it appears to me highly to merit the attention of the farmer; and well deserves to have its several qualities, and the culture that best agrees with it, ascertained by accurate experiments.

2. "*Sheeps fescue grass*, or *festuca ovina*, is much praised by the Swedish naturalists for its singular value as a pasture-grass for sheep; this animal being represented as fonder of it than of any other grass, and fattening upon it more quickly than on any other kind of food whatever. And indeed, the general appearance of the plant, and its peculiar manner of growth, seems very much to favour the accounts that have been given us of it. 56 Sheeps fescue described.

"This plant is of the same family with the former, and agrees with it in several respects; although they may be easily distinguished from one another. Its leaves, like the former, in its natural state, are always rounded, but much smaller; being little bigger than large horse-hairs, or swines-bristles, and seldom exceed six or seven inches in length. But these spring out of the root in tufts, so close upon one another, that they resemble, in this respect, a close hair-brush more than any thing else I know: so that it would seem naturally adapted to form that thick short pile of grass in which sheep are known chiefly to delight. Its flower-stalks are numerous, and sometimes attain the height of two feet; but are more usually about 12 or 15 inches high.

"Upon gathering the seeds of this plant, and sowing them as the former, it was found that they sprung up as quickly as any other kind of grass; but the leaves are at first no bigger than a human hair. From each side springs up one or two of these hair-like filaments, that in a short time send out new off-sets, so as quickly to form a sort of tuft, which grows larger and larger, till it at length attains a very large size, or till all the intervals are closed up, and then it forms the closest pile of grass that it is possible to imagine. In April and May it pushed forth an innumerable quantity of flower-stalks, that afforded an immense quantity of hay; it being so close throughout, that the scythe could scarcely penetrate it. This was allowed to stand till the seeds ripened; but the bottom of the stalks were quite blanched, and almost rotted for want of air before that time. 57 Its appearance when cultivated.

"This

Theory.

"This was the appearance that it made the first year after it was sowed: but I have reason to think, that, after a few years, it likewise produces fewer seed-stalks, and a greater quantity of leaves than at first. But however that may be, it is certain, that if these are eat down in the spring, it does not, like rye-grass, persist in a continual tendency to run to seed; but is at once determined to push forth a quantity of leaves without almost any stalks at all: and as all domestic animals, but more especially sheep, are extremely fond of this grass, if they have liberty to pasture where it grows, they bite it so close as never to suffer almost a single seed-stalk to escape them; so that the botanist will often search in vain for it, when he is treading upon it with his feet. The best way to discover it in any pasture, is to search for it in winter, when the tufts of it may be easily distinguished from every other kind of grass, by their extraordinary closeness, and the deep green colour of the leaves.

28 What soil most proper.

"It seems to grow in almost any soil; altho' it is imagined that it would flourish best in a light sandy soil, as it can evidently live with less moisture than almost any other kind of grass; being often seen to remain in the sods that have been employed in coping for stone-dykes, after all the other grasses that grew in them have disappeared. It is likewise found in poor barren soils, where hardly any other plant can be made to grow at all; and on the surface of dry worn-out peat-moss, where no moisture remains sufficient to support any other plant whatever: but in neither of these situations does it thrive; as it is there only a weak and unsightly plant, very unlike what it is when it has the good fortune to be established upon a good soil; although it is seldomer met with in this last state than in the former.

"I will not here repeat what has been already said about the particular property that this plant possesses of continuing all winter: nor point out the benefits that the farmer may reap from this valuable quality.—He need not, however, expect to find any verdure in winter on such plants as grow upon the loose mossy soil abovementioned; for, as the frost in winter always hoves up the surface of this soil, the roots of the plants are so lacerated thereby, as to make it, for some time in the spring, to all appearance dead. Nor will he often perceive much verdure in winter upon those plants that grow upon poor hungry soils, which cannot afford abundant nourishment to keep them in a proper state of vegetation at all times: but such plants as grow on earthen dykes, which usually begin to vegetate with vigour when the autumnal rains come on, for the most part retain their verdure at that season almost as well as if they were in good garden-mould.

"I have been very particular in regard to this plant; because, in as far as my observations have yet gone, it promises on many accounts to make a most valuable acquisition to the farmer, and therefore justly demands a very particular share of his attention."

59 Holcus lanatus.

3. The *holcus lanatus*, or creeping soft-grass of Hudson.—This is considered by our author as one of the most valuable kinds of meadow-grasses; its pile being exceedingly close, soft, and succulent. It delights much in moisture, and is seldom found on dry ground, unless the soil is exceedingly rich. It is often found on those patches near springs, over which the water frequently flows; and may be known by the uncommon softness and succulence of the blade, the lively light green colour of the leaves, and the matted intertexture of its roots. But, notwithstanding the softness of its first leaves, when the seed-stalks advance, they are rough to the touch, so that the plant then assumes a very different appearance from what we would have expected. The ear is branched out into a great number of fine ramifications somewhat like the oat, but much smaller.—This kind of grass, however, would not be easily cultivated, on account of a kind of soft membrane that makes the seeds adhere to the stalk, and to one another, after they are separated from it, as if they were intermixed with cobweb, so that it is difficult to get them separated from the stalk, or to spread readily in sowing. It spreads, however, so fast by its running roots, that a small quantity sowed very thin, would be sufficient to stock a large field in a short time.

These are the kinds of *grasses*, properly so called, which have not as yet been cultivated, that Mr Anderson thinks the most likely to be of value; but besides these he recommends the following, of the pea-tribe.

60 Milk-vetch.

1. *Milk-vetch*, *liquorice-vetch*, or *milk-wort*. This plant, in some respects, very much resembles the common white clover; from the top of the root a great number of shoots come out in the spring, spreading along the surface of the ground every way round it; from which arise a great many clusters of bright yellow flowers, exactly resembling those of the common broom. These are succeeded by hard round pods, filled with small kidney-shaped seeds. From a supposed resemblance of a cluster of these pods to the fingers of an open hand, the plant has been sometimes called *ladies-fingers*. By others it is called *crow-toes*, from a fancied resemblance of the pods to the toes of a bird. Others, from the appearance of the blossom, and the part where the plant is found, have called it *feal*, improperly *fell-broom*. It is found plentifully almost every where in old grass-fields; but as every species of domestic animals eat it, almost in preference to any other plant, it is seldom allowed to come to the flower in pasture grounds, unless where they have been accidentally saved from the cattle for some time; so that it is only about the borders of corn-fields, or the sides of inclosures to which cattle have not access, that we have an opportunity of observing it. As it has been imagined that the cows which feed on these pastures, where this plant abounds, yield a quantity of rich milk, the plant has from that circumstance, obtained its most proper English name of *milk-vetch*.

61 Its good qualities.

One of the greatest recommendations of this plant is, that it grows in poor barren ground, where almost no other plant can live. It has been observed in ground so poor, that even heath, or ling (*erica communis*), would scarcely grow; and upon bare obdurate clays, where no other plant could be made to vegetate; insomuch that the surface remained entirely uncovered, unless where a plant of this kind chanced to be established; yet even in these unfavourable circumstances, it flourished with an uncommon degree of luxuriance, and yielded as tender and succulent, though not such abundant shoots, as if reared in the richest manured fields. In dry barren sands, also, where almost no other plant could be made to live, it has been found to send out such a number of healthy shoots all around, as to cover the earth with the closest and most beautiful carpet that can be desired.

The stalks of the milk-vetch are weak and slender, so that they spread upon the surface of the ground, unless they are supported by some other vegetable. In ordinary soils they do not grow to a great length, nor produce many flowers; but in richer fields the stalks grow to a much greater length, branch out a good deal, but carry few or no flowers or seeds. From these qualities our author did not attempt at first to cultivate it with any other view than that of pasture; and with this intention, sowed it with his ordinary hay seeds, expecting no material benefit from it till he desisted from cutting his field. In this, however, he was agreeably disappointed; the milk vetch growing, the first season, as tall as his great clover, and forming exceeding fine hay; being scarce distinguishable from lucerne, but by the slenderness of the stalk, and proportional smallness of the leaf.

Another recommendation to this plant is, that it is perennial. It is several years after it is sowed before it attains to its full perfection; but, when once established, it probably remains for a great number of years in full vigour, and produces anually a great quantity of fodder. In autumn 1773, Mr Anderson cut the stalk from an old plant that grew on a very indifferent soil; and after having thoroughly dried it, he found that it weighed 14 ounces and a half.

The stalks of this plant die down entirely in winter, and do not come up in the spring till the same time that clover begins to advance; nor does it advance very fast, even in summer, when once cut down or eat over: so that it seems much inferior to the abovementioned grasses; but might be of use to cover the worst parts of a farm, on which no other vegetable could thrive.

62 Yellow vetchling. 2. The *common yellow vetchling, (Lathyrus pratensis)* or *everlasting tare,* grows with great luxuriance in stiff clay soils, and continues to yield annually a great weight of fodder, of the very best quality, for any length of time. This is equally fit for pasture, or hay; and grows with equal vigour in the end of summer as in the beginning of it: so would admit being pastured upon in the spring, till the middle, or even the end of May, without endangering the loss of the crop of hay. This is an advantage which no other plant except clover possesses; but clover is equally unfit for early pasture or for hay. Sain-foin is the only plant whose qualities approach to it in this respect, and the yellow vetchling will grow in such soils as are utterly unfit for producing sain-foin.—It is also a perennial plant, and increases so fast by its running roots, that a small quantity of the seed would produce a sufficient number of plants to fill a whole field in a very short time. If a small patch of good ground is sowed with the seeds of this plant in rows, about a foot distance from one another, and the intervals kept clear of weeds for that season, the roots will spread so much as to fill up the whole patch next year; when the stalks may be cut for green fodder or hay. And if that patch were dug over the spring following, and the roots taken out, it would furnish a great quantity of plants which might be planted at two or three feet distance from one another, where they would probably overspread the whole field in a short time.

3. The *common blue tare* seems more likely than the former to produce a more nourishing kind of hay, 63 Blue tare.
as it abounds much more in seeds; but as the stalks come up more thinly from the root, and branch more above, it does not appear to be so well adapted for a pasture-grass as the other. The leaves of this plant are much smaller, and more divided, than those of the other; the stalks are likewise smaller, and grow to a much greater length. Though it produces a great quantity of seeds, yet the small birds are so fond of them, that, unless the field was carefuly guarded, few of them would be allowed to ripen.

4. The *Vicia sepium, purple everlasting,* or *bush-vetch.* 64. Bush-vetch.
Our author gives the preference to this plant beyond all others of the same tribe for pasture. The roots of it spread on every side a little below the surface of the ground, from which, in the spring, many stems arise quite close by one another; and as these have a broad tufted top covered with many leaves, it forms as close a pile as could be desired. It grows very quickly after being cut or cropt, but does not arrive at any great height; so that it appears more proper for pasturage than making hay; altho', upon a good soil, it will grow sufficiently high for that purpose; but the stalks grow so close upon one another, that there is great danger of having it rotted at the root, if the season should prove damp. It seems to thrive best in a clay soil.

Besides these, there are are a variety of others of the 65 Everlasting pea.
same class, which he thinks might be useful to the farmer. The common garden everlasting pea, cultivated as a flowering plant, he conjectures, would yield a prodigious weight of hay upon an acre; as it grows to the height of ten or twelve feet, having very strong stalks, that could support themselves without rotting till they attained a great height.

One other plant, hitherto unnoticed, is recommended by our author to the attention of the farmer; it 66 Achillæa millefolium.
is the *common yarrow, (Achillea millefolium),* or *hundred-leaved grass.* Concerning this plant, he remarks, that, in almost every fine old pasture, a great proportion of the growing vegetables with which the field is covered, consists of it; but the animals which feed there are so fond of the yarrow, as never to allow one seed-stalk of it to come to perfection. Hence these seed-stalks are never found but in neglected corners, by the sides of roads; and are so disagreeable to cattle, that they are never tasted; and thus it has been erroneously thought that the whole plant was refused by them.—The leaves of this plant have a great tendency to grow very thick upon one another, and are therefore peculiarly adapted for pasturage. It arrives at its greatest perfection in rich fields that are naturally fit for producing a large and succulent crop of grass. It grows also upon clays; and is among the first plants that strike root in any barren clay that has been lately dug from any considerable depth; so that this plant, and thistles, are usually the first that appear on the banks of deep ditches formed in a clayey soil. All animals delight to eat it; but, from the dry aromatic taste it possesses, it would seem peculiarly favourable to the constitution of sheep. It seems altogether unfit for hay.

Besides these plants, which are natives of Great 67 Lucerne.
Britain there are others, which, though natives of other countries, are found to thrive very well in Britain; and have been raised with such success by individuals,

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viduals, as highly to merit the attention of every farmer. Among these the first place is claimed by lucerne.

This is the plant called *medica* by the ancients, because it came originally from Media, and on the culture of which they bestowed such great care and pains. It hath a perennial root, and annual stalks, which, in good soil, rise to three feet, or sometimes more in height; its leaves grow at a joint like those of clover; the flowers which appear in June, are purple, and its pods of a screw-like shape, containing seeds which ripen in September. All sorts of domestic cattle are fond of this plant, especially when allowed to eat it green, and black cattle may be fed very well with the hay made from it; but an excess of this food is said to be very dangerous.

Lucerne has the property of growing very quickly after it is cut down, insomuch that Mr Rocque has mowed it five times in a season, and Mr Anderson affirms he has cut it no less than six times. It is, however, not very easily cultivated; in consequence of which it sometimes does not succeed; and as it dies entirely in the winter, it is perhaps inferior to the fescue grasses already mentioned, which, tho' despised and neglected, might probably yield as rich a crop as lucerne, without any danger of a miscarriage.

68 Timothy-grass.

Another grass was brought from Virginia, where it is a native, and sown by Rocque in 1763. This grass is called *Timothy*, from its being brought from New-York to Carolina by one Timothy Hanson. It grows best in a wet soil; but will thrive in almost any. If it is sown in August, it will be fit for cutting in the latter end of May or beginning of June. Horses are very fond of it, and will leave lucerne to eat it. It is also preferred by black cattle and sheep; for a square piece of land having been divided into four equal parts, and one part sowed with lucerne, another with san-foin, a third with clover, and the fourth with timothy, some horses, black cattle, and sheep, were turned into it, when the plants were all in a condition for pasturage; and the timothy was eaten quite bare, before the clover, lucerne, or san-foin, was touched.

One valuable property of this grass is, that its roots are so strong and interwoven with one another, that they render the wettest and softest land, on which a horse could not find footing, firm enough to bear the heaviest cart. With the view of improving boggy lands, therefore, so as to prevent their being poached with the feet of cattle, Mr Anderson recommends the cultivation of this kind of grass, from which he has little expectation in other respects.

Sect. VII. *Of the Diseases of Plants.*

These are divided by Tournefort into the following classes. 1. Those which arise from too great an abundance of juice; 2. From having too little; 3. From its bad qualities; 4. From its unequal distribution; and 5. From external accidents.

69 Effects of too great an abundance of juices.

Too great an abundance of juices causes at first a prodigious luxuriant growth of the vegetable; so that it does not come to the requisite perfection in a due time. Wheat is subject, in some climates, to a disease of this kind; it vegetates excessively, without ever carrying ripe grain; and the same disease may be artificially produced in any grain, by planting it in too rich a soil. Too much rain is apt likewise to do the same. When a vegetable is supplied too abundantly with juices, it is very apt to rot; one part of it overshadowing another in such a manner as to prevent the access of fresh air; upon which putrefaction soon ensues, as has been already observed with regard to the fescue grasses.

70 Smut in grain.

In grass, or any herbaceous plant, where the leaves are only wanted, this over luxuriancy cannot be called a disease, but is a very desirable property; but in any kind of grain, it is quite otherwise. Dr Home, in his Principles of Agriculture and Vegetation, classes the *smut* in grain among the diseases arising from this cause. He is of opinion, that too great an abundance of juices in a vegetable will produce diseases similar to those occasioned by repletion in animal bodies; viz. stagnations, corruptions, varices, cariosities, &c. along with the too great luxuriancy we have just now mentioned, which he expresses by "too great an abundance of water-shoots." Hence he is induced to class the smut among diseases arising from this cause; it being a corruption happening most in rainy seasons, and to weak grain. Like other contagious diseases, he tells us, the smut may be communicated from the infected to healthful grain. As a preventative, he recommends steeping the grain in a strong pickle of sea-salt. Besides the effect which this has upon the grain itself, it is useful for separating the good from the bad; the best seed falling to the bottom, and the faulty swimming on the top of the liquor. For the same purpose, a ley of wood-ashes and quicklime is recommended by some; and, by others, a solution of saltpetre or copperas; after which the grain is to be dried with slacked lime, or dry turf ashes. This solution, however, we can by no means recommend, as it seems most likely to kill the grain entirely.

71 How prevented.

72 Diseases from too great moisture, how prevented.

According to Dr Home, dung is a preventative of diseases arising from too great moisture; in confirmation of which, he relates the following experiment. "Two acres of poor ground, which had never got any manure, were fallowed with a design to be sown with wheat; but the scheme being altered, some dung was laid on a small part of it, and the whole sowed, after it had got five furrows, with barley. A great quantity of rain fell. The barley on that part which was dunged was very good; but what was on the rest of the field turned yellow after the rains, and when ripe was not worth the reaping."

73 Disease peculiar to saffron.

The want of nourishment in plants may be easily known by their decay; in which case, the only remedy is, to supply them with food, according to the methods we have already directed, or to remove from their neghbourhood such other plants as may draw off the nourishment from those we wish to cultivate.—In the Memoirs of the Academy of Sciences for 1728, Mr Du Hamel mentions a disease, which he calls *le mort*, that attacks saffron in the spring. It is owing to another plant, a species of trefoil, fixing some violet-coloured threads, which are its roots, to the roots of the saffron, and sucking out its juice. This disease is prevented by digging a trench, which saves all the unaffected.

74 Vegetables destroyed by insects.

The bad qualities, or unequal distributions, of the juices of plants, are the occasion of so few of the diseases to which vegetables in every country are subject, that we forbear to mention them at present. Most of the diseases of plants are owing to external accidents, particularly to the depredations of insects—The insects by which the greatest devastations are committed in Great Britain are, snails, catterpillars, grubs, and flies. The snails and catterpillars feed on the leaves and young shoots;

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75 Insects destroyed by limewater. shoots; by which means they often totally destroy the vegetable. Where the plants are of easy access, these vermin may be destroyed by sprinkling the vegetable with lime-water; for quick-lime is mortal poison to creatures of this kind, and throws them into the greatest agonies the moment they are touched with it. On trees, however, where this method cannot so well be followed, fumigation is the most proper; and, for this purpose, nothing is better than the smoke of vegetables not perfectly dry. In some cases the eggs of these destroying creatures may be observed, and ought without doubt immediately to be taken away. On the fruit trees, as apples, pears, medlars, on some forest-trees, the oak and dwarf-maple especially, and the white and black thorn in hedges, a kind of little tufts are to be observed, resembling, at first sight, withered leaves twisted, by cobweb, about the uppermost twigs or branches. These contain a vast number of little black eggs, that in the spring produce swarms of caterpillars which devour every thing. To prevent this, all the twigs on which these cobwebs appear should be taken off and burnt as soon as possible. This ought to be done before the end of March, that none of the eggs be allowed sufficient time for hatching.

76 Grubs. The grubs are a kind of worms which destroy the corn by feeding upon its roots; they are transformed every fourth year into the beetles called *cock-chaffers*, *may-bugs*, &c. they are very destructive when in their vermicular state, and cannot then be destroyed because they go deep in the ground. When become beetles, they conceal themselves under the leaves of trees, where they seem asleep till near sunset, when they take their flight. It is only now that they can be destroyed, and that by a very laborious method; namely, by spreading pack-sheets below the trees in the day-time when the beetles are in their torpid state, then shaking them off and burning them. Some time ago, they made such devastations in the county of Norfolk, that several farmers were entirely ruined by them; one gathered 80 bushels of these insects from the trees which grew on his farm. It is said that, in 1574, there fell such a multitude of these insects into the river Severn, that they stopped and clogged the wheels of the water-mills.

77 Turnip fly. Turnips, when young, are apt to be totally destroyed by a multitude of little black flies, from thence called the *turnip-fly*. As a preventative of these, some advise the seed to be mixed with brimstone; but this is improper, as brimstone is found to be poisonous to vegetables. The best method seems to be the fumigation of the fields with smoke of half-dried vegetables.

78 Prevented by fumigation, &c. For this purpose weeds will answer as well as any. This fumugation must no doubt be often repeated, in order to drive away the innumerable multitudes of these insects which are capable of destroying a large field of turnip.

Some have supposed that the fly is either engendered in new dung, or enticed by it; and have therefore advised the manure to be laid on in the autumn preceding, by which it loses all its noxious qualities, while its nutritive ones are retained, notwithstanding these might be supposed liable in some degree to be exhaled by the sun. This method is said to have been ascertained by experiments; and it is added, that another material advantage accruing from autumn manuring for turnips is, that all the seeds contained in the dung, and which of course are carried on the land with it, vegetate almost immediately, are mostly killed by the severity of the winter, and the few that remain seldom avoid destruction from the plough-share.

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79 Various remedies against the turnip-fly. The following method of sowing has also been recommended as a preventative of the fly:—"About Midsummer, take the first opportunity when it rains, or there is an apparent certainty of rain approaching, to sow your turnip seed; if about the full moon, the better. In this case, neither harrow, brush, nor roll, after sowing. The natural heat of the ground at that season, and the consequent fermentation occasioned by copious rain, will give an astonishingly quick vegetation to the seed, which in a few days will be up and out of all danger from the fly. At all events, sow not till it rains; it is better to wait a month, or even longer, for rain, than to sow (merely for the sake of sowing about the usual time) when the ground is parched with heat. By the scorching of the sun, the oil and vegetative quality of the seed are exhausted; and the few weak plants that come up will be destroyed by the fly before they can attain strength to put forth their rough leaves. The fly infests the ground abundantly in dry hot weather, but does no injury in rain. The falling rain will sufficiently wash the turnip-seed into the ground without harrowing it in; which, instead of merely covering, too often buries this small seed at so great a depth, as never afterwards to get above ground."

The following remedies are also recommended as having often proved successful:—A small quantity of soot sown over the land at their first appearance. Branches of elder with the leaves bruised, drawn in a grate over them. Musk mixed with the seed before it is sown. And sulphur burnt under it, after moistening it with water in which tobacco has been steeped.

But showers on the plants as soon as they appear above ground, are esteemed the best preservatives. They enfeeble and kill the fly, and hasten the plants into the rough leaf, in which state they are out of danger.

The sweet smell of the turnip has been thought to attract the fly; upon which supposition, the remedy appeared to consist in overpowering that smell by one which is strong, fetid, and disagreeable. Hence it has been recommended, that upon an acre of turnips sown in the usual way, a peck or more of dry soot be thrown after the ground is finished, and in as regular a way as he sows the seed.

Some time ago an insect, called the *corn-butterfly*, committed such ravages while in its vermicular state, in France, that upwards of 200 parishes were ruined by it; and the ministry offered a reward to the discoverer of an effectual remedy against this destroying worm. The cure which was at last discovered, was to heat the corn, in an oven, so much as not to destroy its vegetative power, but sufficiently to destroy the small worms which made their nest in the substance of the grain, and at last eat out the substance so completely that nothing could be got from the husk, even by boiling it in water. It is certain, that though insects can bear a great deal of cold, they are easily destroyed by a slight degree of heat; nor is the vegetative power of corn easily destroyed, even when kept for a long time in a pretty strong heat. This method must therefore be very effectual for destroying all kinds of 80 Corn butterfly.

insects

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insects with which grain is apt to be infected: but care must be taken not to apply too great a heat; and the adjusting of the precise degree necessary to destroy the insect, without hurting the corn, will be attended with some difficulty.

81 The curled disease in potatoes.

The curled disease in potatoes has long been a subject of investigation and experiment among farmers; and the knowledge of its cause and cure seems yet to remain a desideratum. The Agricultural Society at Manchester, a few years ago, offered a premium for discovering by actual experiment the cause of the disease in question; and a great variety of letters were, in consequence, addressed to them upon the subject.—As these contain many interesting observations both on the disease itself and the best methods hitherto adopted for preventing it, the following abstract of them may not improperly be introduced in this place.

82 Various methods of prevention.

I. According to the writer of the first letter, this disease is caused by an insect produced by frost or bad keeping before setting; and the newest kinds, such as have been raised within these nine or ten years, are most apt to curl, because they will not stand to be kept in winter and spring before setting, as the old kinds will. In autumn 1776, he got up a bed of potatoes to lay by in winter, leaving plenty in the ground as regular as possible; and, before the severity of winter came on, covered part of the bed with straw and pease-haulm, and left the other part of the bed uncovered. That part of the bed which was covered was quite free from curled ones; but the uncovered part produced a great many curled, owing, as the writer says, to frost and severity of the weather.

II. This writer had about a quarter of an acre of potatoes, well manured with cow and horse dung, and took the greatest care in picking the fine smooth-skinned potatoes for sets; yet nine out of ten parts were curled. He attributes the cause of this disease to a white grub or insect, which he found near the root, about half an inch long, with eight or ten legs, its head brown and hard; as upon examining a number of the curled roots, he found them all bitten, chiefly from the surface to the root, which of course stopped the progress of the sap, and threw the leaf into a curl. The uncurled roots were not bitten. He tried a few experiments as follow:—First, he put soot to the insects in the rows for two days; and after that, he put lime to them for the same time, but they still kept lively; next he put a little salt, which destroyed them in a few hours. From which he infers, that if coarse salt were put into the ground at the time the land is preparing for potatoes, it would effectually cure this distemper.

III. In this letter, the cause of the disease is attributed to the method of earthing the stems while in cultivation; and the branch, striking root into the new earthed-up soil, it is said, produces potatoes of such a nature as the year following to cause the disease complained of.

To prevent the disease, it is recommended to take the sets from those potatoes that have not bred any from the branch covered; or otherwise, to dig the part the sets are to be raised from.

IV. According to this writer, the disorder proceeds from potatoes being set in old-tilled or worn-out ground; for though those potatoes may look tolerably well, yet their sets will most, if not all, produce curled potatoes. Hence he is convinced, that no sets ought to be used from old-tilled or couch-grass land; and that, in order to have good sets, they should be procured from land that was purposely fallowed for them; from fresh ley land, where they are not curled; or from ley land that was burnt last spring. He directs to plant them on virgin mould, and the potatoes will have no curled ones amongst them; and to keep them for winter, from any other kind.

To avoid the uncertainty of getting good sets, he recommends crabs to be gathered from potatoes growing this year on fresh land free from curl, and the next spring to sow them on fresh ley land; and continue to plant their sets on fresh ley land yearly, which he is convinced will prevent the curl.

All the good potatoes he saw this year, either on fresh ley land or on old-tilled land, were raised from sets that grew upon fresh ley land last year; and where he has seen curled potatoes, he found, upon inquiry, the potato-sets grew upon old-tilled and worn-out land last year. He gives as a general reason for the disorder, that the land is oftener cropt than it had used to be, much more corn being now raised than formerly.

V. In 1772, this writer planted some potatoes by accident full nine inches deep: when taken up, many of the plants were rotted, and a few curled. He kept the whole produce for seed, and planted two acres with it in 1773, not quite six inches deep. The crop was amazingly great; and he did not observe any curled plants among them. In 1774, many of these were planted in different soils; yet they were so infected with the curled disease, that not one in twenty escaped. In 1775, the complaint of this disease became general. In 1776, it occurred to him that the good crop of 1773 was owing to the accidental deep setting of 1772; and that the reason why the same seed became curled in 1774, was their being set so near the surface in 1773; and attributes the disease to the practice of ebb-setting. In 1777, he took some potatoes from a crop that was curled the year before, and after cutting the sets, left them in a dry room for a month. Half were planted in ground dug fourteen days before; the other half, having been steeped in a brine made of whitster's ashes for two hours, were also planted in the same land at the same time. The steeped ones came up ten days before the others, and hardly any missed or were curled. The unsteeped ones generally failed, and those few that came up were mostly curled.

He therefore advised as a remedy, 1. That the potatoes intended for next year's sets be planted nine inches deep. 2. That they remain in the ground as long as the season will permit. 3. That these sets be well defended from frost till the beginning of March. 4. That the sets be cut a fortnight before planting. 5. That they be steeped, as above, two hours in brine or ley. 6. That the dung be put *over* the sets. And 7. That fresh sets be got every year from sandy soils near the coast, or on the shore.

P. S. At planting, the hard dry sets should be cast aside, for they will probably be curled. Curled potatoes always proceed from sets which do not rot or putrefy in the ground.

VI. This writer had five drills of the old red potatoes, and four of the winter whites, growing at the same time in the same field. The drills were prepared exactly

exactly alike. Among the red not one was curled; the winter whites were nearly all curled. He ſays he has found by experience, that the red never curl.

VII. Two of the writer's neighbours had their ſets out of one heap of potatoes. They both ſet with the plough, the one early, and the other late in the ſeaſon. Moſt of thoſe early ſet proved curled, and moſt of thoſe ſet late ſmooth; the latter on clay land.

A few roods of land were alſo planted with ſmall potatoes, which had lain ſpread on a chamber floor all the winter and ſpring, till the middle of May. They were ſoft and withered; they proved ſmooth and a good crop. Middle-ſized potatoes, withered and ſoft, which had been kept in a large dry cellar, and the ſprouts of which had been broken off three times, produced alſo a ſmooth good crop.

Hence he was led to think a ſuperfluity of ſap, occaſioned by the ſeed being unripe, might cauſe the diſeaſe. To be ſatisfied in this, he aſked the farmer whether he had ſet any of the ſame potatoes this year, and what was the nature of his land? He told him "he had; that they had been ſet on his farm fourteen years, without ever curling; that his ſoil was a poor whitiſh ſand of little depth; that he let thoſe he deſigned for keeping grow till they were fully ripe."

Hence he concludes, the only ſure way to prevent the curl is, to let potatoes intended for ſeed ſtand till they are fully ripe, and to keep them dry all winter.

VIII. This writer ſet a quantity of the red potatoes, without having a curled one amongſt them. His method is, when the ſets are cut, to pick out ſuch as are reddeſt in the inſide. On digging them up at Michaelmas, he mixes none of the curled ſeed among the others. The curled are eaſily diſtinguiſhed, by their ſtalks withering two months before the reſt of the crop.

The cauſe of the curled diſeaſe he attributes to potatoes being of late years produced from ſeed inſtead of roots, as formerly. Such will not ſtand good more than two or three years, uſe what method you pleaſe. Laſt ſpring, he ſet the old red and white ruſſets, and had not a curled potato amongſt them.

On the lime-ſtone land about Denbigh, in North Wales, they have no curled potatoes. If this be owing to the nature of that land, perhaps lime might prevent the diſeaſe.

IX. According to this writer, all ſorts of grain wear out and turn wild if ſown too long on the ſame land; the ſame will hold good in all ſorts of pulſe, peaſe, beans, and (as he conceives) potatoes. It generally happens, that thoſe who have moſt curled potatoes plant very ſmall ſets.

Eleven years ago he bought a parcel of freſh ſets, of the golden-dun kind, and has uſed them without change to the preſent year, without any being curled. This he principally attributes to his having always planted good large ſets.

About four years ſince, he thought of changing his ſets, as his potatoes were too ſmooth, too round, and much diminiſhed in ſize. But the curl at that time beginning to be very alarming, he continued his ſets till part of his crop miſſing laſt year, he was obliged to buy new ſets this ſpring, which, being ſmall, were curled like other peoples.

He allows, that the curl has frequently happened to perſons who have uſed large potatoes for ſets; for, as all roots are not equally affected, ſome curled ones may be mixed with the reſt.

To prevent the evil, cut your ſets from clean and middle-ſized potatoes, gathered from places as clear of the curl as poſſible; preſerve them as uſual till ſpring. If any are harder or graſh more in cutting than uſual, caſt them aſide. He would alſo recommend the raiſing a freſh ſort from the crab produced on the ſorts leaſt affected, which in Lancaſhire are the long-duns.

X. Set potatoes with the ſprits broke off, and they will (ſays the writer of this letter) be curled ones; if ſet with the ſprits on, they will not be curled. Again, take a potato which is ſprit, and cut a ſet off with two ſights: break one ſprit off, and let the other ſtay on, and ſet it; the former will be curled, and the latter will not.

When you have holed your potatoes, take them out before they are ſprit, and lay them dry until you have ſet or ſown them, and you will have no curled potatoes.

XI. This writer was at the expence of procuring ſets at fifty miles diſtance, and where this diſeaſe was not known. The firſt year's trial was ſucceſsful; the year following he procured ſets from the ſame place, but one-fifth of his crop was infected. By way of experiment, he planted ſets from roots which had been infected the year before, and ſome of theſe produced healthy plants, free from all infection.

As every effect muſt have a cauſe, he ſuppoſed it might be ſome inſect, which, living on the leaves, gave them that curled and ſickly appearance, as is the caſe in the leaves of many ſhrubs and trees. But whether the inſect is lodged in the old ſets, and to be deſtroyed at the time of planting, or, proceeding from ſome external cauſe, can only be deſtroyed afterwards, he is not yet certain, although he has made the following experiments.

On a piece of ground that had not been dug for 20 years, he planted four rows of ſets, which he knew to be perfectly clear; the drills were two feet diſtant, the ſets one foot diſtant in each drill. He then planted on the ſame ground four rows with ſets from curled potatoes at equal diſtances; in each row were about 20 ſets.

Lot 1ſt, the curled ſtate.

N° 1. Without manure, | N° 3. In ſoot,
2. In ſalt, | 4. In quicklime.

Lot 2d, the clear ſets.

N° 1. Without manure, | N° 3. In ſoot,
2. In ſalt, | 4. In quicklime.

Thoſe planted in ſalt and ſoot in both lots were deſtroyed. In lot 1. n° 1. and 4. all curled. Lot 2. n° 1. and 4. quite clear.

This experiment was made on a ſuppoſition that the inſect lodged in the ſet, and muſt be deſtroyed by planting. But of that he is not fully ſatisfied. He repeated ſalt, ſoot, and quicklime, on the branches of ſeveral curled potatoes. Salt deſtroyed all he touched with it. Lime and ſoot had, he thought, a partial effect on the plants. After ſome time, they appeared almoſt as healthy as the reſt. Thus, although he had done little towards the cure, he flatters himſelf he has pointed

Theory. pointed out the cause, the insects on the curled plants being not only very numerous, but visible to the naked eye.

XII. This writer ascribes the cause of the disease to the frost, and bad keeping in winter and spring before setting. They are liable to be damaged by frost after they are set, but this may be prevented by covering. If it be asked, why frost did not injure them formerly? he answers, it is only the NEW kinds which are apt to curl. To this may be added, that less care is now taken of the seed than formerly. To prevent the latter, let them remain in the ground covered with haulm or litter, till the time they are wanted for setting; and, in case no frost touches them afterwards, they will be free from the disease.

XIII. This writer says, the red potato was as generally planted as the winter-white and the Lincolnshire kidney are now. The first, being a later potato, did not sprout so early as the others. The white sprout very early, and therefore should first be moved out of the place where they have been preserved in the winter. Instead of that, they are often let remain till their roots and sprouts are matted together. On separating them, these sprouts are generally rubbed off, and they are laid by till the ground is ready; during which interval they sprout a second time: but these second sprouts, being weak and languid, will shrink, sicken, and die; and the fruit at the roots will be small, hard, ill shaped, and of a brown colour.

Now, if putting off the sprouts once or more, before the sets are put in the ground, be the cause (as he verily believes it is) of the curled disease, an easy remedy is at hand. When the potatoes intended for sets are dug up, lay them in a west aspect as dry as possible: in such a situation they will not sprout so soon. The best time for removing most sorts, is the first fine day after the 24th of February. Cut them into sets as soon as possible, and let them remain covered with dry sand till the ground is prepared, which should be a winter fallow. Lay the sets in without breaking off any of the sprouts, for the second will not be so vigorous. This accounts for one sprout out of three from the same set being curled. The two stems not curled rose from two later eyes, and were first sprouts. The sprout curled was a second, the first having been rubbed off.

XIV. This writer says, that last spring one of his neighbours cut and set, in the usual way of drilling, some loads of the largest potatoes he could procure; and more than half of them proved curled. Being a few sets short of the quantity wanted, he planted some very small potatoes which he had laid by for the pigs. These being fully ripe and solid, there was not a curled plant among them. He apprehends, the others being curled was owing to their not being fully ripe. A crop of potatoes, set this year in rows on ground that had borne a crop of them last year, were mostly curled; but many plants came up from seed left in the ground last season, and there was not a curled one among them.

XV. Of late years, this writer says, great improvements have been made in setting potatoes and cutting the sets. The ground is dressed cleaner and dunged stronger. Many people, in drilling, wrap up the sets entirely in the dung; by which means, though their potatoes are larger, the disease seems to be increased. They also cut their sets out of the richest and largest potatoes, which is perhaps another cause of this evil. In cold countries, where they set their own seed, which has grown on poor land, with less dung, they have no curled plants. On the contrary, when they bought rich and large potatoes for seed, they have been curled in great quantities. He believes, the richness and largeness of the seed to be the cause of the evil; for he does not remember to have seen a curled stem which did not spring from a set of a large potato.

XVI. This writer apprehends the curled disease in potatoes to proceed from a defect in the *planta seminalis*, or seed-plant; and from comparing curled ones with others, there appeared to be a want of, or inability in, the powers of expanding or unfolding the parts of the former; which, from this defect, forms shrivelled, starved, curled stems. On examining some of the sets at the time of getting the crop, he found them hard and undecayed; so hard, indeed, that some of them would not be soft with long boiling. This led him to think, that some manures might have the same effect on them as tanners ooze has on leather, and so harden them, that the embryo plant could not come forth with ease; but a closer examination taught him otherwise, and that that they grow equally in all manures.

Some have thought that the fermentation is occasioned by too great quantities being heaped together; but the writer has seen an instance, wherein a single potato, preserved by itself, when set, produced stems of the curled kind. He thinks the most consistent and rational opinion is, that the disease is occasioned by the potatoes being taken from the ground before the stamen, or miniature-plant, is properly matured and ripened.

For let it be observed, that the potato, being a native of a warmer climate, has there more sun, and a longer continuance in the ground, consequently, it has not the same natural causes in a cold climate to mature the seed-plant as in its native state. All the opportunities, therefore, ought to be given in which climate will admit for nature to complete her work, and fit the stamen for the next state of vegetation, especially in those intended for seed. But if the potato be taken up before the seed-plant be fully matured, or the air and sap-vessels have acquired a proper degree of firmness or hardness, it must, when thus robbed of further nutrition, shrivel up; and when the vessels, in this immature state, come to act again in the second state of vegetation, they may produce plants which are curled.

If it be asked, why are they more common now than formerly? he answers, that before the present mode of setting them took place, people covered them, while in the ground, with straw, to protect them from frost.

If it be asked, why one set produces both curled and smooth stems? he answers, we suppose every eye to contain a *planta seminalis*; that all the embryos, or seed-plants, contained in one potato, are nourished by one root; that, as in ears of corn, some of these seed-plants may be nourished before others.

One of his neighbours, last year, set two rows of potatoes,

Theory.

potatoes, which proving all curled, he did not take them up; and this year there is not a curled one among them. Such potatoes, therefore, as are designed for seed, should be preserved as long in the ground as possible.

XVII. This writer advises such sets to be planted as grow in moss-land; and, he says, there will not be a single curled one the first year. This is affirmed by the inhabitants of two townships, where they grow amazing quantities.—A medical gentleman sowed last year two bushels of sets from one of the above places, and had not one curled; but on sowing them again this year, he had a few.

Notwithstanding there seems to be a diversity of opinions in the above writers, occasioned by the different appearances of their crops, and the seemingly contrary effects of the means used to prevent or cure the disease, we conceive that the following general propositions may be fairly drawn from the whole. 1. That some kinds of potatoes are (*cæteris paribus*) much more liable to be affected by the disease than the rest; and that the old-red, the golden-dun, and the long-dun, are the most free from it.—2. That the disease is occasioned by one or more of the following causes, either singly or combined: 1st, By frost, either before or after the sets are planted: 2d, From planting sets out of large unripe potatoes: 3d, From planting too near the surface, and in old worn-out ground: 4th, From the first shoots of the sets being broken off before planting; by which means there is an incapacity in the *planta seminalis* to send forth others sufficiently vigorous to expand so fully as they ought.—3. That the most successful methods of preventing the disease, are cutting the sets from smooth middle-sized potatoes, that were full ripe, and had been kept dry after they were taken out of the ground; and without rubbing off their first shoots, planting them pretty deep in fresh earth, with a mixture of quicklime, or on lime-stone land.

A correspondent of the Bath Society is convinced that, whatever may be its cause, the fault itself is inherent in the seed; and has communicated the following method of avoiding it: "I made a hot-bed in the following manner: (which method I have used ever since) I laid horse-dung, &c. (as is generally used in making hot-beds) about 18 inches thick; over which I spread a layer of fine rich mould about four or five inches thick: upon the top of this mould I laid, in different divisions, a certain number of potatoes of various sorts, some of my own growth, and others brought from different parts, and covered these lightly over with more mould; they soon came up. I then observed which was freest from the blight or curl; for if there were not more than one defective in *forty* or *fifty*, I concluded I might set of that sort with safety. This method I have now practised near twelve years, and never lost my crop or any part thereof worth mentioning; whilst my neighbours, who followed the old method, were frequently disappointed in their crops; and to the best of my knowledge, all those of my neighbours who have of late been persuaded to take the trouble of using the same means as myself, have never failed of success to their utmost wishes in one instance; nor do I ever think it will fail, if duly attended to; the fault being some hidden cause in the seed unknown at present, and I believe incurable by any means, at least which have yet come to my knowledge. My reason for planting my hot-beds so soon is, that if the frost hinders the first experiment, or they all prove bad, I may have time to make a second or third if necessary, with different sorts of seed, before the proper season arrives for planting in the fields and grounds appointed for the great and general crop."

PART II. PRACTICE OF AGRICULTURE.

SECT. I. *Instruments of Husbandry.*

THE instruments employed in agriculture are various; as the plough, the harrow, the roller, &c. which are again greatly diversified by various constructions adapted to particular uses.

1. Of PLOUGHS.

83 Scots plough.

THE plough constructed in the following manner is still the most common and the most generally understood in Scotland: and, if properly made, is the best for answering all purposes, when only one is used; though others are, perhaps, more proper on some particular occasions.

84 Description of the Scots plough.

The parts of which this plough is composed, are, the head, the beam, the sheath, the wrest, the mould-board, the two handles, the two rungs, the sock, and the coulter; the two last are made of iron, and all the rest of wood.

Plate V. fig. 1.

The HEAD, is designed for opening the ground below. The length of the head from A to B is about 20 inches, and the breadth from A to D about five inches; C is the point upon which the sock is driven, and the length from B to C is about six inches; *a* is the mortoise into which the larger handle is fixed, and *b* is the mortoise into which the sheath is fixed.

The head is that part of the plough which goes in the ground; therefore the shorter and narrower it is, the friction will be the less, and the plough more easily drawn: but the longer the head is, the plough goes more steadily, and is not so easily put out of its direction by any obstructions that occur. Twenty inches is considered as a mean length; and five inches is the most convenient breadth.

The SHEATH, E, is driven into the mortoise *b*, and thus fixed to the head A B. It is not perpendicular to the head, but placed obliquely, so as to make the angle formed by the lines A B and E B about 60 degrees. The sheath is about 13 inches long, besides what is driven into the mortoise *b* (fig. 1.); about three inches broad, and one inch thick. Fig. 2.

The sheath is fixed to the mould-board, as in fig. 11. E, in the same manner as the wrest is fixed to the head in fig. 7.

The MOULD-BOARD, is designed to turn over the earth of the furrow made by the plough; and it is obvious, that, according to the position of the sheath, the mould-board will turn over the earth of the furrow more or less suddenly. Besides, when it forms a less angle with the head than 60 degrees, the plough is in great danger of being *choked*, as the farmers term it. Fig. 3

The

Fig. 3. The Larger HANDLE, F A, is fixed to the head, by driving it into the mortoise *a* (fig. 1.). It is placed in the same plane with the head; and its length from A F is about five feet four inches, and its diameter at the place where it is fixed to the beam is about two inches and an half, and tapers a little to the top F. About ten inches from A, there is a curve in the handle, which, when F is raised to its proper height, makes the lower part of it nearly parallel to the sheath E B. This curve is designed to strengthen the handle. The proper position of the handle is, when the top F is about three feet two inches higher than the bottom of the head A B.

The longer the handles, the plough is the more easily managed, because the levers are more distant from the centre of motion. The higher the top of the handles, the plough is more easily raised out of the ground, provided they be no higher than the lower part of a man's breast.

Fig. 4. The BEAM, is fixed to the larger handle and the sheath, all of which are placed in the same plane with the head. The length of it, from H to I, is about six feet; its diameter is about four inches. When the plough is in the ground, the beam should be just high enough not to be incommoded by any thing on the surface.

The position of the beam depends on the number of cattle in the plough. When two horses are yoked, the beam should be placed in such a manner as to make the perpendicular distance betwixt the bolt-hole of the beam and the plane of the head about 21 inches; when four horses are yoked, two a-breast, this distance should only be about 18 inches.

Fig. 5. The SOCK, B P, is fixed to the end of the head, and is about two feet long. In fitting the Sock to the head, the point ought to be turned a little to the land or left side; because otherwise it is apt to come out of the land altogether. When turned to the left, it likewise takes off more land; when turned upwards, the plough goes shallow; and when downwards, it goes deeper.

Fig. 6. The COULTER, is fixed to the beam, and is about two feet ten inches long, two inches and a half broad, sharp at the point and before, and thick on the back, like a knife. It is fixed and directed by wedges, so as to make the point of it equal to, or rather a little before the point of the sock, and upon a line with the left side of the head. This oblique position enables it to throw roots, &c. out of the land, which requires less force than cutting or pushing them forward.

Fig. 7. The WREST, B D, is fixed to the head, and is about 26 inches long, two broad, and one thick. It is fixed to the head at B, in such a manner as to make the angle contained between the lines AB and BD about 25 degrees. The wrest is seldom or never placed in the same place with the head, but gradually raised from the place where it is fixed to it; that is, from B to K, as in fig. 8. The position of the wrest determines the nature of the furrow. When the wrest is wide and low set, the furrow is wide; and when it is narrow and high set, the furrow is narrow.

Fig. 9. represents the two HANDLES, fixed together by the two rungs. The larger handle has already been described; the lesser one is a few inches shorter, and does not require to be quite so strong. The distance of the handles at the little rung depends on the position of the wrest. Their distance at M and P is about two feet six inches. The lesser handle is fixed to the mould board at M, fig. 10. and to the wrest K B, at L.

Fig. 11. represents the plough complete, by joining together figures 6. and 10. in the sheath E B. The wrest B K is supposed to make an angle with the head A B as in fig. 7. and the handles joined together as in fig. 9.

After having given such a particular description of all the parts and proportions of the Scots plough, it will easily appear how it separates, raises, and turns over the earth of the furrow. If it had no coulter, the earth would open above the middle of the sock, and in a line before the sheath; but as the coulter opens the earth in a line with the left side of the head, if the soil has any cohesion, the earth of the furrow will be wholly raised from the left side, and, as the sock moves forward, will be thrown on the right side of the sheath, and by the casting out of the mould-board, or the raising of the wrest, will be turned over.

The BRIDLE, or MUZZLE, is another article belonging to the plough. It is fixed to the end of the beam, and the cattle are yoked by it. The muzzle commonly used is a curved piece of iron, fixed to the beam by a bolt through it. A B C is the muzzle, A C the bolt by which it is fixed to the beam; D. is the swingle-tree or cross-tree, to which the traces are fixed; and B is a hook, or *cleek*, as it is commonly called, which joins the muzzle and swingle-tree. Fig. 12.

Some use another kind of muzzle, A B C D. It is fixed to the beam by two bolts, and has notches by which the cleek of the swingle-tree may be fixed either to the right or the left of the beam. There are also different holes for the hind-bolt to pass thro', by which the draught may be fixed either above or below the beam. A D is the fore-bolt upon which the muzzle turns; on B C are four notches, betwixt any two of which the cleek of the swingle-tree may be fixed. When the cleek is fixed at B, the plough is turned towards the firm land, and takes off a broader furrow; and when fixed at C, it is turned towards the ploughed land, and takes off a narrower furrow. E and F are the holes on each side thro' which the hindmost bolt passes. When the bolt is put thro' the highest two, these holes being thereby brought to the middle of the beam, the fore-part of the muzzle is raised above the beam, and the plough is made to go deeper; and when put through the lowest two, the fore part of the muzzle is sunk below the beam, and the plough is made to go shallower. This muzzle may be so constructed as to have the same play with the common one. A is the end of the beam; B a plate of iron sunk into it, and with a similar one in the other side, is rivetted into it by bolts; C is the muzzle fixed to these plates of iron by the bolt D, which bolt may be put through any of the holes E E. From the construction of this muzzle it is plain, that it has the same play with the common one, and that by it the land of the plough may be altered at pleasure. Fig. 13. Fig. 16.

85 Properties of the Scots plough.

Of all forms, that of the Scotch plough is the fittest for breaking up stiff and rough land, especially where stones abound; and no less fit for strong clays hardened by drought. The length of its head gives it a firm hold of the ground; its weight prevents it from being thrown out by stones; the length of the handles gives the ploughman great command to direct its motion;

Practice. tion; and by the length of its head, and of its mouldboard, it lays the furrow-slice cleverly over. This plough was contrived during the infancy of agriculture, and was well contrived: in the soils above described, it has not an equal.

86
In what soil improper.

But in tender soil it is improper, because it adds greatly to the expence of ploughing, without any counterbalancing benefit. The length of the head and mould-board increases the friction, and consequently it requires a greater number or oxen or horses than are necessary in a shorter plough. There is another particular in its form, that resists the draught: the mouldboard makes an angle with the sock, instead of making a line with it gently curved backward. There is an objection against it no less solid, that it does not stir the ground perfectly: the hinder part of the wrest rises a foot above the sole of the head; and the earth that lies immediately below that hinder part, is left unstirred. This is ribbing land below the surface, similar to what is done by ignorant farmers on the surface.

These defects must be submitted to in a soil that requires a strong heavy plough; but may be avoided in a cultivated soil by a plough differently constructed. Of all the ploughs fitted for a cultivated soil free of stones, that introduced into Scotland about 20 years ago, by James Small in Blackadder Mount, Berwickshire, is the best. It is now in great request; and with reason, as it avoids all the defects of the Scots plough. The shortness of its head and of its mould-board lessen the friction greatly: from the point of the sock to the back part of the head it is only 30 inches; and the whole length, from the point of the beam to the end of the handles, between eight and nine feet. The sock and mouldboard make one line gently curving; and consequently gather no earth. Instead of a wrest, the under edge of the mouldboard is in one plain with the sole of the head; which makes a wide furrow, without leaving any part unstirred. It is termed the *chain-plough*, because it is drawn by an iron chain fixed to the back part of the beam immediately before the coulter. This has two advantages: first, by means of a muzzle, it makes the plough go deep, or shallow; and, next, it stresses the beam less than if fixed to the point, and therefore a slenderer beam is sufficient.

87
Chain-plough Plate V. fig. 1.

This plough may be well considered as a capital improvement; not only by saving expence, but by making better work. It is proper for loams; for coarse clays; and, in general, for every sort of tender soil free of stones. It is even proper for opening up pasture-ground, where the soil has been formerly well cultivated.

88
Of the Sock Plate V.

A spiked sock is used in the Scotch plough. The difference between it and the feathered sock will be best understood by comparing their figures. Fig. 14. is the common sock, and fig. 15. the feathered one.

From the construction of the feathered sock, it is obvious, that it must meet with greater resistance than the comon sock. However, when the plough takes off the earth of the furrow broader than that part of the sock which goes upon the head, it is more easily drawn than the plough with the common sock; for the earth which the common sock leaves to be opened by the wrest, is more easily opened by the feather of the other sock. In ley, the feathered sock makes the plough go more easily, because the roots of the grass, which go beyond the reach of the plough, are more easily cut by the feather, than they can be torn asunder by the common sock. The feathered sock is also of great use in cutting and destroying root-weeds. The common sock, however, answers much better in strong land.

It is proper here to add, that in fitting the feathered sock to the head, the point of it should be turned a little from the land, or a little to the right hand.

89
Ignorance of farmers in Scotland but a few years ago.

If we look back 30 years, ploughs of different constructions did not enter even into a dream. The Scotch plough was universally used, and no other was known. There was no less ignorance as to the number of cattle necessary for this plough. In the south of Scotland, six oxen and two horses were universal; and in the north, 10 oxen, sometimes 12. The first attempt to lessen the number of oxen was in Berwickshire. The low part of that county abounds with stone, clay, and marl, the most substantial of all manures, which had been long used by one or two gentlemen. About 25 years ago it acquired reputation, and spread rapidly. As two horses and two oxen were employed in every marl-cart; the farmer, in summer-fallowing, and in preparing land for marl, was confined to four oxen and two horses. And as that manure afforded plenty of succulent straw for oxen, the farmer was surprised to find that four oxen did better now than six formerly. Marling, however, a laborious work, proceeded slowly, till people were taught by a noted farmer in that country, what industry can perform by means of power properly applied. It was reckoned a mighty task to marl five or six acres in a year. That gentleman, by plenty of red clover for his working-cattle, accomplished the marling 50 acres in a summer, once 54. Having so much occasion for oxen, he tried with success two oxen and two horses in a plough; and that practice became general in Berwickshire.

90
Advantages of the chain plough particularly illustrated.

Now here appears with lustre the advantage of the chain-plough. The great friction occasioned in the Scotch plough by a long head, and by the angle it makes with the mouldboard, necessarily requires two oxen and two horses, whatever the soil be. The friction is so much less in the chain-plough, that two good horses are found sufficient in every soil that is proper for it. Besides, the reducing the draught to a couple of horses has another advantage, that of rendering a driver unnecessary. This saving on every plough, where two horses and two oxen were formerly used, will, by the strictest computation, be L. 15 Sterling yearly; and where four horses were used, no less than L. 20 Sterling. There is now scarce to be seen in the low country of Berwickshire a plough with more than two horses; which undoubtedly in time will become general. We know but of one further improvement, that of using two oxen instead of two horses. That draught has been employed with success in several places; and the saving is so great, that it must force its way every where. It may be confidently affirmed, no soil stirred in a proper season, can ever require more than two horses and two oxen in a plough, even supposing it the stiffest clay. In all other soils, two good horses, or two good oxen abreast, may be relied on for every operation of the chain-plough.

A chain-plough of a smaller size than ordinary, drawn

Plate V

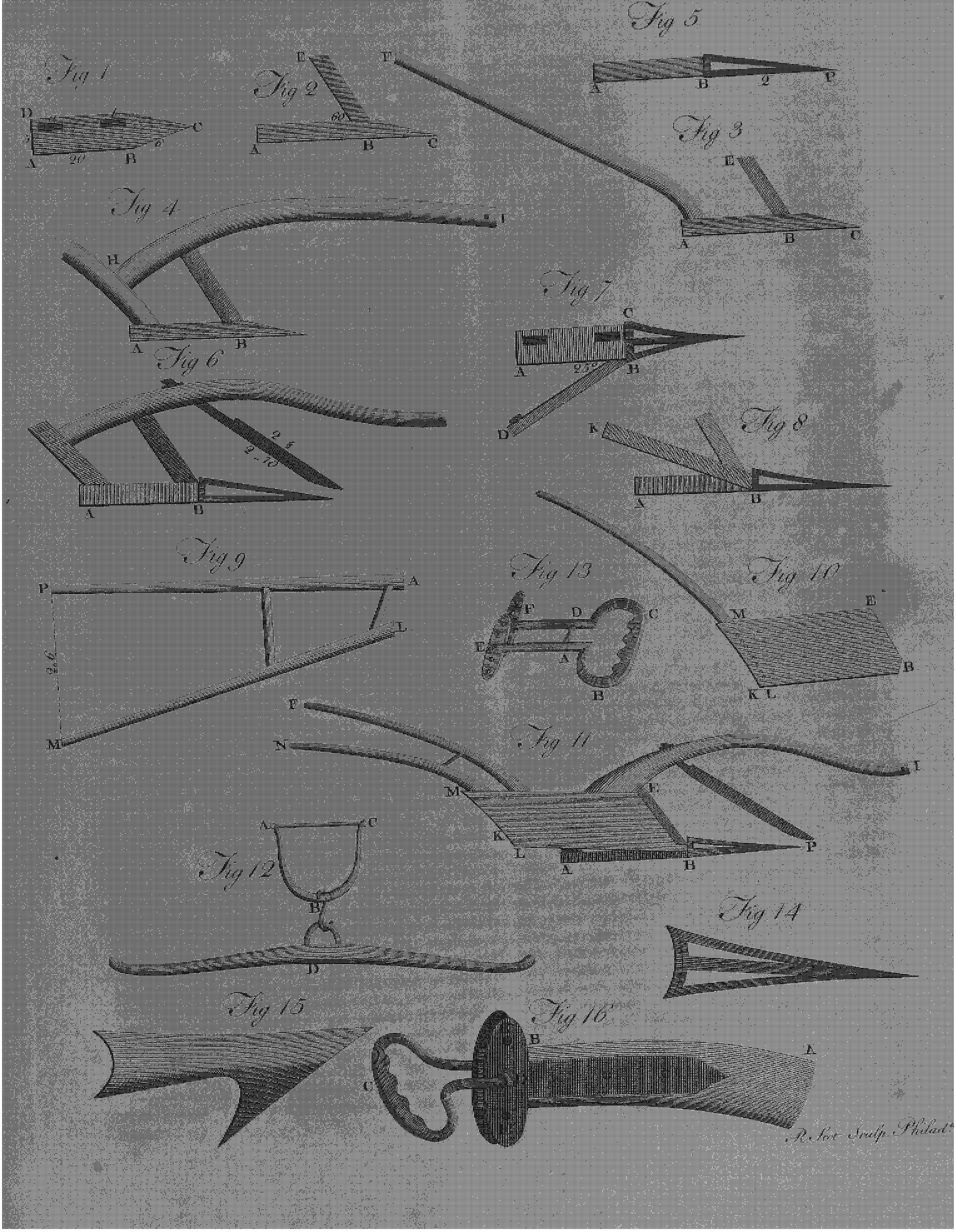
Fig 1
Fig 2
Fig 3
Fig 4
Fig 5
Fig 6
Fig 7
Fig 8
Fig 9
Fig 10
Fig 11
Fig 12
Fig 13
Fig 14
Fig 15
Fig 16
R Scot Sculp Philad

Practice.

drawn by a single horse, is of all the most proper for horse-hoeing, supposing the land to be mellow, which it ought to be for that operation. It is sufficient for making furrows to receive the dung, for ploughing the drills after dunging, and for hoeing the crop.

91 A small single horse plough recommended for various purposes.

A still smaller plough of the same kind may be recommended for a kitchen-garden. It can be reduced to the smallest size, by being made of iron; and where the land is properly dressed for a kitchen-garden, an iron plough of the smallest size drawn by a horse will save much spade-work. In Scotland, thirty years ago, a kitchen-garden was an article of luxury merely, because at that time there could be no cheaper food than oatmeal. At present, the farmer maintains his servants at double expence, as the price of oat-meal is doubled; and yet he has no notion of a kitchen-garden more than he had thirty years ago. He never thinks, that living partly on cabbage, kail, turnip, carrot, would save much oat-meal: nor does he ever think, that change of food is more wholesome, than vegetables alone, or oat-meal alone. We need not recommend potatoes, which in scanty crops of corn have proved a great blessing: without them, the labouring poor would frequently have been reduced to a starving condition. Would the farmer but cultivate his kitchen-garden with as much industry as he bestows on his potatoe crop, he need never fear want; and he can cultivate it with the iron plough at a very small expence. It may be held by a boy of 12 or 13; and would be a proper education for a ploughman. But it is the landlord who ought to give a beginning to the improvement. A very small expence would inclose an acre for a kitchen-garden to each of his tenants; and it would excite their industry, to bestow an iron plough on those who do best.

Nor is this the only case where a single-horse plough may be profitably employed. It is sufficient for seed-furrowing barley, where the land is light and well-dressed. It may be used in the second or third ploughing of fallow, to encourage annual weeds, which are destroyed in subsequent ploughings.

92 Rotheram Plough, Plate VII, fig. 3.

The *Rotheram plough* is a machine of very simple construction, and easily worked. AB is the beam, CD the sheath, EBD the main handle, FR the smaller handle, GH the coulter, KI the sock or share, NP the bridle, S the fly-band, and ML a piece of wood in place of a head. The whole of this plough should be made of ash or elm; the irons should be steeled and well-tempered; and that part of the plough which is under ground in tilling should be covered with plates of iron. The difference between this and the common plough seems to consist in the bridle at the end of the beam, by which the ploughman can give the plough more or less land by notches at N, or make it cut deeper or shallower by the holes at P; in the coulter or share, which are so made and set as to cut off the new furrow without tearing; and in the mould-board, which is so shaped at first to raise a little, and then gradually turn over the new cut furrow with very little resistance. But the greatest advantage attending it, is its being so easy of draught, that it will do double the work of any common plough.

The *Paring plough* is an instrument used in several parts of England for paring off the surface of the ground, in order to its being burnt. Mr Bradley has given the following description of a very simple instrument of this kind: From A to A (fig. 15.) is the plough-beam, about seven feet long, mortised and pinioned into the block B, which is of clean timber without knots. CC are the sheaths or standards, made flat on the inside, to close equally with the paring plate, and fastened to it with a bolt and key on each side, as at D. E is the paring plate of iron laid with steel, about four inches wide, and from 12 to 18 inches long. This plate must be made to cut on the sides, which are bolted to the standards as well as at the bottom part. FF are two iron braces to keep the standards from giving way: these standards must be mortised near the outsides and through the block. GG are the plough handles, which must be fixed slope-ways between the beam and the standards. The pin-holes in the beam, the use of which is to make the plough cut more or less deep, by fixing the wheels nearer to or farther from the paring plate, should not be above two inches asunder.

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93 The Paring Plough, Plate VII, fig. 4.

94 The Four-coultered Plough, Plate VII.

Fig. 1. represents the four-coultered plough of Mr Tull. Its beam is ten feet four inches long, whereas that of the common plough is but eight. The beam is straight in the common plough, but in this it is straight only from *a* to *b*, and thence arched: so that the line let down perpendicularly from the corner at *a*, to the even surface on which the plough stands, would be 11½ inches; and if another line were let down from the turning of the beam at *b* to the same surface, it would be one foot eight inches and a half; and a third line let down to the surface from the bottom of the beam at that part which bears upon the pillow, will show the beam to be two feet ten inches high in that part. At the distance of three feet two inches from the end of the beam *a*, at the plough-tail, the first coulter, or that next the share, is let through; and at 13 inches from this, a second coulter is let through: a third at the same distance from that; and, finally, the fourth at the same distance from the third, that is, 13 inches: and from *a* to *b* is seven feet.

The crookedness of the upper part of the beam of this plough is contrived to avoid the too great length of the three foremost coulters, which would be too much if the beam was straight all the way; and they would be apt to bend and be displaced, unless they were very heavy and clumsey. Ash is the best wood to make the beam of, it being sufficiently strong, and yet light. The sheat in this plough is to be seven inches broad. The fixing of the share in this, as well as in the common plough, is the nicest part, and requires the utmost art of the maker; for the well-going of the plough wholly depends upon the placing this. Supposing the axis of the beam, and the left side of the share, to be both horizontal, they must never be set parallel to each other; for if they are, the tail of the share bearing against the trench as much as the point, would cause the point to incline to the right hand, and it would be carried out of the ground into the furrow. If the point of the share should be set so, that its side should make an angle on the right side of the axis of the beam, this inconvenience would be much greater; and if its point should incline much to the left, and make too large an angle on that side with the axis of the beam, the plough would run quite to the left hand;

and if the holder, to prevent its running quite out of the ground, turns the upper part of his plough towards the left hand, the pin of the share will rise up, and cut the furrow diagonally, leaving it half unploughed. To avoid this and several other inconveniences, the straight side of the share must make an angle upon the left side of the beam; but that must be so very acute a one, that the tail of the share may only press less against the side of the trench than the point does. This angle is shown by the pricked lines at the bottom of fig. 9. where *ef* is supposed to be the axis of the beam let down to the surface, and *gf* parallel to the left side of the share; and it is the subtense *eg* that determines the inclination which the point of the share must have towards the left hand. This subtense, says Mr Tull, at the fore-end of an eight-feet beam, should never be more than one inch and a half, and whether the beam be long or short, the subtense must be the same.

The great thing to be taken care of, is the placing the four coulters; which must be so set, that the four imaginary places described by their four edges, as the plough moves forward, may be all parallel to each other, or very nearly so; for if any one of them should be very much inclined to, or should recede much from either of the other, then they would not enter the ground together. In order to place them thus, the beam must be carefully pierced in a proper manner. The second coulter-hole must be two inches and a half more on the right hand than the first, the third must be as much more to the right of the second, and the fourth the same measure to the right hand of the third; and this two inches and a half must be carefully measured from the centre of one hole to the centre of the other. Each of these holes is a mortise of an inch and quarter wide, and is three inches and a half long at the top, and three inches at the bottom. The two opposite sides of this hole are parallel to the top and bottom, but the back is oblique, and determines the obliquity of the standing of the coulter, which is wedged tight up to the poll. The coulter is two feet eight inches long before it is worn; the handle takes up sixteen inches of this length, and is allowed thus long, that the coulter may be driven down as the point wears away. As to the wheels, the left hand wheel is 20 inches diameter, and that on the right hand two feet three inches, and the distance at which they are set from each other is two feet 5½ inches.

2. The Patent Sward-cutter.

36 Patent Sward-cutter, Plate VI.

The different parts of this instrument are represented by Nº 1. 2. 3. of fig. 6. A. A. &c. a square frame 3 feet 4 inches from the fore to the hind part, by 4 feet 3 inches, the breadth of the machine within side; the timber (when of fir) 4 inches square, placed on two wheels B. B. 3 feet diameter, a little more or less (the old fore-wheels of a chaise may answer the purpose), to support the hind part of the machine.

C. C. &c. are six strong pieces of wood, called *bulls*, 3 feet long, 5 inches and a half broad, the thickness 6 inches at E. and tapering to 3 inches at F. Into these bulls are fixed the cutting wheels, which are iron, 13 inches diameter, ⅜ths of an inch thick at the centre, about an inch diameter for piercing holes to fix the iron axles in; from that they are to be of such thickness, as allow the edges to be well steeled. The wheels are fixed by two bolts going through the bulls, with eyes on one end for the axles of the wheels to run in, and nuts and screws on the other to make them very firm and sunk in the bulls, to prevent their interfering with the weights L. L. &c. resting on them.

G. G. &c. are hollow pieces of wood, called *thorles*, each 3½ inches long, which inclose the bolt M. M. and keep the bulls C. C. &c. at their proper distances, but may be made longer or shorter at pleasure, according as the sward requires to be cut in larger or smaller pieces. They are in two pieces bound together, and jointed by a strap of leather or cord, which allows them to be readily changed when the cutting wheels require to be kept at more or less distance.

The iron bolt M. M. goes through two pieces of wood or iron P. P. 7 inches long, clear of the wood, supported by iron stays fixed to the frame, and thro' all the bulls. It requires to be strong, as the draught of the horses terminate there.

H. H. Nº 2. and 3. a cylinder or segment of wood, 7 inches diameter, called a *rocking tree*, which goes across the frame, and moves on the pivots fixed into it, one at each end, supported by an iron bolt or piece of wood mortised into the frame, 8 inches high, as appears in Nº 2. and 3. to which 6 chains or ropes are fixed by hooks, at different distances, as you want your cuts, 9, 8, 7, or six inches from one another, and are joined to the end of each bull in which the cutting wheels run; so that when the rocking tree is turned about by the lever I. fixed in the middle of it, all the bulls, with their cutting wheels, are raised out of the ground at once, as in Nº 3. by which means the machine may be turned, or moved from place to place with great ease, without any danger of straining the wheels.

L. L. L. &c. Nº 1. 2. 3. are weights of freestone, 26 inches long and 6 inches broad; the under one 4 inches thick, the upper one 3 inches thick; weighing about 64 lb. the under, and 48 the upper; each of them having two holes, through which iron spikes, firmly fixed in the bulls, pass, in order to keep them steady.

When the ground is easily cut, the under stone may answer; when more difficult, the other stone may be added; so that every wheel may have 7 stone-weight upon it, which has been found sufficient for the stiffest land and toughest sward the machine has ever been tried on. Cast iron weights will answer fully better, but are more expensive.

The lever I. Nº 2. 3. which ought to be 5 feet long, must have a sliding rope on it; fixed to the back part of the frame; so that when the cutting wheels are all taken out of the ground three or four inches, by the rocking tree's being turned partly round by the lever, the rope may be fixed to it by a loop over the pin R. Nº 3. (it ought to be placed 3 feet 4 inches from the extremity of the lever I.) Thus all the cutting wheels are kept out of the ground till the machine is turned; and then by moving the loop off the pin, it slips back towards the frame, and the lever is gently let back to its place, as in Nº 2. by which the cutting wheels are put into their former posture, by the weights fixed on the bulls in which they run. The levers may be made of good tough ash.

P. P. Nº 1.

P. P. N° 1. a small bolt of iron, with a hook on one end of it (one is sufficient), to strengthen the bolt M. M. to be hooked on the centre of it, and joined to the frame by a nut and screw.

The grooves in which the cutting wheels run, may be covered below at the hinder part with a plate of thin black iron, 6 inches long, 3 inches broad, having a slit in it where the wheels run, to prevent (if found necessary) any grass, weeds, or small stones, from filling the grooves, and clogging the wheels.

To the frame N° 1. are fixed (for a double-horse sward-cutter) three shafts, as in a waggon, of such length, strength, and distance from one another, as any workman may think proper.

For a single-horse sward-cutter (which has only four cutting wheels); a pair of shafts are used, and may make the two sides of the frame without any joinings. The width of the frame, in proportion to the double-horse sward-cutter, is as four to six.

It is recommended for a double-horse sward-cutter to have eight bulls and wheels, in order that when it is used to reduce hard clody summer-fallow, or land for barley, before the last furrow, or even after it, the whole weight (42 stone) employed in cutting the stiffest land and toughest sward, may be applied to the 8 bulls then at 6 inches from one another. The 64 lb. weights to be applied to six of the bulls, and two of the 48 lb. weights to each of the additional bulls, which is a sufficient weight for the purpose, and will effectually prevent a clod of more than six inches breadth from escaping being broke to pieces.

In the same manner, a single-horse sward-cutter may have six bulls for the abovementioned purpose; the 28 stone belonging to it divided thus: The 64 lb. weights to four of the bulls, and two of the 48 lb. weights to each of the additional bulls.

That the machine may come as cheap as possible to the public, the inventor is of opinion, that the expence of the two wheels and the iron axle (which is considerable) may be saved, by joining strongly to the frame at S. N° 3. a piece of wood with a little curve at the extremity of it, resembling the foot of a sledge, formerly much used in Scotland to carry in the corn from the field; the part of it resting on the ground being kept 18 inches (the half diameter of the wheels) from the frame, by a strong support of wood.

As the two outer bulls next the frame are apt to get under it, so as to prevent the cutting wheels from being taken out of the ground, a thin slip of iron fixed to the inside of the frame, nearly opposite to the back end of the bulls, of convenient length, will be found necessary.

The original intention of this machine was to prepare old grass-ground for the plough, by cutting it across the ridges, in the beginning of or during winter, when the ground is soft, in order to answer all the purposes that Mr Tull proposed by his four-coulter plough above described, and so strongly recommended by him for bringing into tilth grass-ground that has been long rested. This the sward-cutter has been found to do much more effectually and expeditiously: For Mr Tull's machine cuts the sward in the same direction with the plough; and is liable, from every obstruction any of the coulters meet with, to be thrown out of its work altogether, or the instrument broken: to which the sward-cutter, consisting of four, six, or more cutting wheels, is never liable, from these being entirely independent of one another, cutting the ground across the ridges before ploughing, and rendering that operation easier to two horses than it would be to three without its being cut. The furrow being cut across, falls finely from the plough in squares of any size required not under six inches, in place of long slips of tough sward seldom and imperfectly broke by the four-coultered plough.

This instrument is very fit for preparing ground for burnbating, as it will save much hand-labour.

It may be properly used in cross-cutting clover of one or two years standing, to prepare the ground for wheat, if the land is stiff and moist enough.

It may be applied to cutting and cross-cutting pasture-ground, intended to have manure of any kind put upon it to meliorate the grass. In this it will far exceed the scarificator mentioned in one of Mr Young's tours; as that instrument is liable, as well as the four-coultered plough, to be thrown out of its work when meeting with a stone or other interruption. This the sward-cutter is proof against, which is looked on as its greatest excellence.

In preparing for barley, the sward-cutter excels a roller of any kind in reducing the large hard clods in clay land, occasioned by a sudden drought, after its being ploughed too wet; and it is likewise very proper for reducing such clay land when under a summer-fallow. In this operation, the sward-cutter is greatly to be preferred to the cutting-roller, likewise mentioned by Mr Young in one of his tours; for the wheels of the latter being all dependent one on another, when one is thrown out by a stone, three or four must share the same fate. Besides, the cutting-roller has but seven wheels in six feet; whereas the sward-cutter has six in four feet three inches, at nine inches distance; and, if necessary, may have them so near as six inches.

After old grass-ground is cut across with the sward-cutter and ploughed, it has a very uncommon and worklike appearance, from each square turned over by the plough being raised up an inch or two at the side last moved by the earth-board; so that the field, when finished, is all prettily waved, and resembles a piece of water when blown on by a gentle breeze. By this means a very great deal of the land's surface is exposed to the frost and other influences of the air, which cannot fail to have a good effect on it.

Two horses are sufficient for the draught of a double-horse sward-cutter, and one horse for a single-horse one. One man manages the machine and drives the horses. He begins his operation by first measuring off 20 or 30 paces from the machine, less or more as he inclines, and there fixes a pole. He then cuts the field cross, as near at right angles with the ridges as he can. When the cutting wheels are past the last furrow about a yard or so, and the machine is upon the outmost ridge of the field on which it must turn, he must stop the horses; then take hold of the lever I. N°. 2. and by pulling it to him he raises the cutting wheels out of the ground, which are kept so by the loop of the rope being put over the pin R. in the lever I. N° 3. till the machine is turned and brought to its proper place, which is done by measuring off the same distance for-

 merly

Practice.

merly done on the opposite side of the field. When the cutting wheels are exactly over the outmost furrow, then, on the horses being stopped, the rope is slipt off the pin R, and the lever returned to its former place, as represented N°2. which allows the weights L. L. &c. to force the cutting wheels into the ground again. He then goes on till the interval betwixt the first and second stroke of the machine is all cut. In this manner the field is to be finished, after which you may begin to plough when you please. (N. B. There must be a pole at each side of the field.

It is of no consequence whether the land to be sward-cut is in crooked ridges or straight, in flat ridges or in very high raised ones. Be the surface ever so uneven, the cutting wheels, being all independent of one another, are forced by their weights into every furrow or hollow.

One sward-cutter will cut as much in one day as six ploughs will plough.

The land may lie several months in winter after being sward-cut, when there is no vegetation to make the cuts grow together again before it is ploughed; but the sooner it is ploughed after cutting the better, that it may have the benefit of all the winter's frost, which makes it harrow better in seed-time.

When the ground is harrowed, the harrows ought to go with the waves which appear after ploughing, not against them, as by that means they are less apt to tear up the furrows all cut into squares. This, however, need only be attended to the two first times of harrowing, as they are called.

Any common wright and smith may make the instrument. It is very strong, very simple, and easily managed and moved from place to place; and, if put under cover, will last many years.

It was invented some time ago by the honourable Robert Sandilands; and is represented in the Plate as it has been lately improved by him, the price being at the same time reduced from L. 15 or L. 16 to L. 5 or L. 6.

3. The Brake.

96 Brake described, Plate VI. fig. 2.

The brake is a large and weighty harrow, the purpose of which is to reduce a stubborn soil, where an ordinary harrow makes little impression. It consists of four square bulls, each side five inches, and six feet and a half in length. The teeth are 17 inches long, bending forward like a coulter. Four of them are inserted into each bull, fixed above with a screw-nut, having 12 inches free below, with a heel close to the under part of the bull, to prevent it from being pushed back by stones. The nut above makes it easy to be taken out for sharping. This brake requires four horses or four oxen. One of a lesser size will not fully answer the purpose: one of a larger size will require six oxen: in which case the work may be performed at less expence with the plough.

97 Uses.

This instrument may be applied to great advantage in the following circumstances. In the fallowing strong clay that requires frequent ploughings, a breaking between every ploughing will pulverize the soil, and render the subsequent ploughings more easy. In the month or March or April, when strong ground is ploughed for barley, especially if bound with couch-grass, a cross-breaking is perferable to a cross-ploughing, and is done at half the expence. When ground is ploughed from the state of nature, and after a competent time is cross-ploughed, the brake is applied with great success; immediately after the cross-ploughing, to reduce the whole to proper tilth.

Let it be observed, that a brake with a greater number of teeth than abovementioned, is improper for ground that is bound together by the roots of plants, which is always the case of ground new broken up from its natural state. The brake is soon choked, and can do no execution till freed from the earth it holds. A less number of teeth would be deficient in pulverizing the soil.

4. The Harrow.

Harrows are commonly considered as of no use but to cover the seed; but they have another use scarce less essential, which is to prepare land for the seed. This is an article of importance for producing a good crop. But how imperfectly either of these purposes is performed by the common harrow, will appear from the following account of it.

98 Imperfection of the common harrow.

The harrow commonly used is of different forms. The first we will mention has two bulls, four feet long and 18 inches asunder, with four wooden teeth in each. A second has three bulls and 12 wooden teeth. A third has four bulls, and 20 teeth of wood or iron, 10, 11, or 12 inches asunder. Now, in fine mould, the last may be sufficient for covering the seed; but none of them are sufficient to prepare for the seed any ground that requires subduing. The only tolerable form is that with iron teeth; and the bare description of its imperfections will show the necessity of a more perfect form. In the first place, this harrow is by far too light for ground new taken up from the state of nature, for clays hardened with spring-drought, or for other stubborn soils: it floats on the surface; and after frequent returns in the same tract, nothing is done effectually. In the next place, the teeth are too thick set, by which the harrow is apt to be choked, especially where the earth is bound with roots, which is commonly the case. At the same time, the lightness and number of teeth keep the harrow upon the surface, and prevent one of its capital purposes, that of dividing the soil. Nor will fewer teeth answer for covering the seed properly. In the third place, the teeth are too short for reducing a coarse soil to proper tilth; and yet it would be in vain to make them longer, because the harrow is too light for going deep into the ground. Further, the common harrows are so ill constructed, as to ride at every turn one upon another. Much time is lost in disengaging them. Lastly, it is equally unfit for extirpating weeds. The ground is frequently so bound with couch-grass, as to make the furrow-slice stand upright, as when old lea is ploughed: notwithstanding much labour, the grass-roots keep the field, and gain the victory.

A little reflection, even without experience, will make it evident, that the same harrows, whatever be the form, can never answer all the different purposes of harrowing, nor can operate equally in all different soils, rough or smooth, firm or loose. The following, therefore, have been recommended; which are of three different

99 Improved harrows. Plate VI. fig. 3.

ferent forms, adapted for different purposes. They are all of the same weight, drawn each by two horses. Birch is the best wood for them, because it is cheap, and not apt to split. The first is composed of four bulls, each four feet ten inches long, three and a quarter inches broad, and three and a half deep; the interval between the bulls 11 and three-fourths inches; so that the breadth of the whole harrow is four feet. The bulls are connected by four sheths which go thro' each bull, and are fixed by timber-nails driven through both. In each bull five teeth are inserted, ten inches free under the bull, and ten inches asunder. They are of the same form with those of the brake, and inserted into the wood in the same manner. Each of these teeth is three pounds weight; and where the harrow is made of birch, the weight of the whole is six stone 14 pounds, Dutch. An erect bridle is fixed at a corner of the harrow, three inches high, with four notches for drawing higher or lower. To this bridle a double tree is fixed for two horses drawing abreast, as in a plough. And to strengthen the harrow, a flat rod of iron is nailed upon the harrow from corner to corner in the line of the draught.

Fig. 4. The second harrow consists of two parts, connected together by a crank or hinge in the middle, and two chains of equal length, one at each end, which keep the two parts always parallel, and at the same distance from each other. The crank is so contrived, as to allow the two parts to ply to the ground like two unconnected harrows; but neither of them to rise above the other, more than if they were a single harrow without a joint. In a word, they may form an angle downward, but not upward. Thus they have the effect of two harrows in curved ground, and of one weighty harrow in a plain. This harrow is composed of six bulls, each four feet long, three inches broad, and three and a half deep. The interval between the bulls nine and a half inches; which makes the breadth of the whole harrow, including the length of the crank, to be five feet five inches. Each bull has five teeth, nine inches free under the wood, and ten inches asunder. The weight of each tooth is two pounds; the rest as in the former.

Fig. 5. The third consists also of two parts, connected together like that last mentioned. It has eight bulls, each four feet long, two and a half inches broad, and three deep. The interval between the bulls is eight inches; and the breadth of the whole harrow, including the length of the crank, is six feet four inches. In each bull are inserted five teeth, seven inches free under the wood, and ten and a half inches asunder, each tooth weighing one pound. The rest as in the two former harrows.

100 Properties of these harrows.

These harrows are a considerable improvement. They ply to curved ground like two unconnected harrows; and when drawn in one plain, they are in effect one harrow of double weight, which makes the teeth pierce deep into the ground. The imperfection of common harrows, mentioned above, will suggest the advantages of the set of harrows here recommended. The first is proper for harrowing land that has long lain after ploughing, as where oats are sown on a winter-furrow, and in general for harrowing stiff land: it pierces deep into the soil by its long teeth, and divides it minutely. The second is intended for covering the seed: its long teeth lays the seed deeper than the common harrow can do: which is no slight advantage. By placing the seed considerably under the surface, the young plants are, on the one hand, protected from too much heat, and, on the other, have sufficiency of moisture. At the same time, the seed is so well covered that none of it is lost. Seed slightly covered by the common harrows wants moisture, and is burnt up by the sun; beside, that a proportion of it is left upon the surface uncovered. The third harrow supplies what may be deficient in the second, by smoothing the surface, and covering the seed more accurately. The three harrows make the ground finer and finer, as heckles do lint; or, to use a different comparison, the first harrow makes the bed, the second lays the seed in it, the third smooths the cloaths. They have another advantage not inferior to any mentioned: they mix manure with the soil more intimately than can be done by common harrows; and upon such intimate mixture depends greatly the effect of manure as has already been explained. To conclude, these harrows are contrived to answer an established principle in agriculture. That fertility depends greatly on pulverizing the soil, and on an intimate mixture of manure with it, whether dung, lime, marl, or any other.

The Chain and Screw Harrow. Fig. 8. is the plan of a harrow also invented by Mr Sandilands, and to which he has given the name of the *chain and screw harrow.* Its properties are, that if your ridges be high, and you wish to harrow them from one end to the other, by lengthening the chain (which the screw commands), the harrow, when drawn along, forms an angle downwards, and misses none of the curve of the ridge, so far as it extends (which may be nine feet, the distance from A to B. The extent, in the contrary direction is five feet six inches). When the crowns of the ridges have got what is thought sufficient harrowing lengthwise, you shorten the chain by the screw, which forms an angle upwards: the harrow is then drawn by the horses, one on each side of the furrow; which completely harrows it, and the sides of the ridge, if 18 feet broad. Plate VI.

When you want to harrow even ground or high ridges across with the screw, you can bring the harrow to be horizontal, so as to work as a solid harrow without a joint.

The teeth are formed and fixed in the common manner, square, not in the fashion of coulters; and are nine or ten inches below the wood, and of such strength as it is thought the land requires. The teeth cut, or rather tear, the ground at every four inches without variation, though seemingly placed irregularly; and this without any risk of choaking, except sometimes at the extreme angles, where the teeth are necessarily near each other; but which may be cleaned with the greatest ease, by raising them a little out of the ground. The figures 1, 2, &c. point out where the 12 teeth on each side of the harrow are placed.

Where a strong brake-harrow is not necessary, by making the teeth shorter and lighter, you may have 48 teeth, which will tear the ground at every two inches, cover the seed well, and make a fine mould.

It is recommended, that harrows for every purpose, and

and of any size, be made on the above principle; by which no tooth can ever follow the track of another, and all of them will be kept constantly acting.

5. The Roller.

101 The roller.

The roller is an instrument of capital use in husbandry, though scarcely known in ordinary practice; and, where introduced, it is commonly so slight as to have very little effect.

Rollers are of different kinds; stone, cast-iron, wood. Each of these has its advantages. We would recommend the last, constructed in the following manner. Take the body of a tree, six feet ten inches long, the larger the better, made as near a perfect cylinder as possible. Surround this cylinder with three rows of fillies, one row in the middle, and one at each end. Line these fillies with planks of wood equally long with the roller, and so narrow as to ply into a circle. Bind them fast together with iron-rings. Beech-wood is the best, being hard and tough. The roller thus mounted, ought to have a diameter of three feet ten inches. It has a double pair of shafts for two horses abreast. These are sufficient in level ground; in ground not level, four horses may be necessary. The roller without the shafts ought to weigh 200 stone Dutch; and the large diameter makes this great weight easy to be drawn.

102 Season for rolling.

Rolling wheat in the month of April is an important article in loose soil; as the winter-rains pressing down the soil leave many roots in the air. Barley ought to be rolled immediately after the seed is sown; especially where grass-seeds are sown with it. The best time for rolling a gravelly soil, is as soon as the mould is so dry as to bear the roller without clinging to it. A clay soil ought neither to be tilled, harrowed, nor rolled, till the field be perfectly dry. And as rolling a clay soil is chiefly intended for smoothing the surface, a dry season may be patiently waited for, even till the crop be three inches high. There is the greater reason for this precaution, because much rain immediately after rolling is apt to cake the surface when drought follows. Oats in a light soil may be rolled immediately after the seed is sown, unless the ground be so wet as to cling to the roller. In a clay soil, delay rolling till the grain be above ground. The proper time for sowing grass-seeds in an oat-field, is when the grain is three inches high; and rolling should immediately succeed, whatever the soil be. Flax ought to be rolled immediately after sowing. This should never be neglected; for it makes the seed push equally, and prevents after growth; the bad effect of which is visible in every step of the process for dressing flax. The first year's crop of sown grasses ought to be rolled as early the next spring as the ground will bear the horses. It fixes all the roots precisely as in the case of wheat. Rolling the second and third crops in loose soil is an useful work; though not so essential as rolling the first crop.

103 Effects of rolling.

In the first place, rolling renders a loose soil more compact and solid; which encourages the growth of plants, by making the earth clap close to every part of every root. Nor need we be afraid of rendering the soil too compact; for no roller that can be drawn by two or four horses will have that effect. In the next place, rolling keeps in the moisture, and hinders drought to penetrate. This effect is of great moment. In a dry season, it may make the difference of a good crop, or no crop, especially where the soil is light. In the third place, the rolling grass-seeds, besides the foregoing advantages, facilitates the mowing for hay; and it is to be hoped, that the advantage of this practice will lead farmers to mow their corn also, which will increase the quantity of straw both for food and for the dunghill.

There is a small roller for breaking clods in land intended for barley. The common way is, to break clods with a mall: which requires many hands, and is a laborious work. This roller performs the work more effectually, and at much less expence; let a harrowing precede, which will break the clods a little; and after lying a day, or a day and an half, to dry, this roller will dissolve them into powder. This however does not supersede the use of the great roller after all the other articles are finished, in order to make the soil compact, and to keep out the summer-drought. A stone roller four feet long, and fifteen inches diameter, drawn by one horse, is sufficient to break clods that are easily dissolved by pressure. The use of this roller in preparing land for barley is gaining ground daily, even among ordinary tenants, who have become sensible both of the expence and toil of using wooden malls. But in a clay soil, the clods are sometimes too firm, or too tough, to be subdued by so light a machine. In that case, a roller of the same size, but of a different construction, is necessary. It ought to be surrounded with circles of iron, six inches asunder, and seven inches deep; which will cut even the most stubborn clods, and reduce them to powder. Let not this instrument be considered as a finical refinement. In a stiff clay, it may make the difference of a plentiful or scanty crop.

6. The Fallow-cleansing Machine.

104 The fallow-cleansing machine. Plate VII. fig. 5.

This was invented by Mr Aaron Ogden, a smith at Ashton-under-Line, near Manchester in Lancashire. It is intended for cleansing fallows from weeds, &c. which exhaust the riches of the soil. A, A, is the frame; B, the first roller; C, the second ditto; in which last are two cranks to move the arms D, D, which work the rake up the directors fixed on the plank E. The under side of the lower ends or shares of these directors are sharp, to cut the clods and let them come on the upper side. Each alternate heel of the share is longer than the intermediate one, that they may not have more than one-half to cut at once. At the back of the plank E are two screws to let it loose, that the directors may be set higher or lower. The shares are to penetrate the ground two or three inches, to raise the quicks till the rake I, I, fetches them into the cart H, where a man must be ready with a muck-hook to clear them backward when gathered. In the rake I are two teeth for every space of the directors, that stones, &c. may be gathered without damage. K, K, are two staples, by which the machine is drawn: under them at *h* are two hooks; placed low to raise the machine in turning, by the help of the traces; and the axle-tree of the cart should be fixed upon a pin, that it may turn like a waggon. F, F, are the triggers to throw the rake behind the roots. The long teeth at G, G, are to cleanse the roller C. I, I, is the rake which gathers up the weeds into

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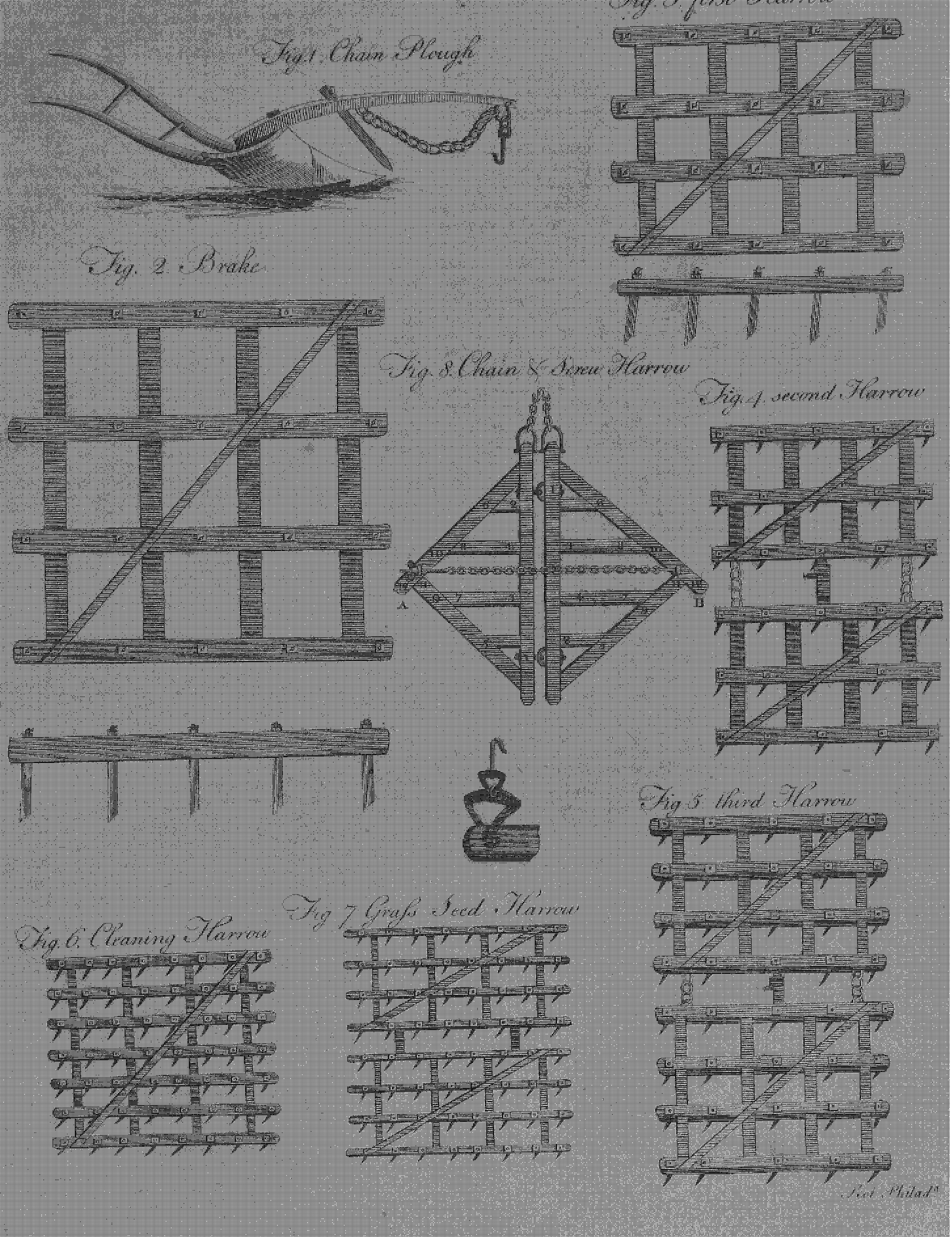
Plate VI



Practice. into the cart H, and is drawn above the trigger F by the working of the arms D, expressed by the dotted lines at *d d, i i i*. The triggers F, of which there is one on each side, move on the pivots *a*; so that when the points *b*, of the rake I, have been drawn up by the directors E to the part marked *c*, the trigger, giving way permits the rake to pass; but immediately falling, the rake returns along the upper surface of the trigger marked *e, e*, and of course falls on the weeds when it comes to the end, a little beyond the pivot *a*. The reader will observe, that the boarding is taken away on one side, in the Plate, in order to give a more perfect view of the inner part of the machine; and in fact it would perhaps be better if all the boarding, marked L, L, L, was taken away, and frame-work put in its stead. The cart H might undoubtedly also be made lighter. The wheels M, M, appear in the Plate to be made of solid wood; but there is no necessity that it should be so. At N is another view of the roller C, by which the disposition of the spikes may be easily comprehended. Suppose the circle O, described by the end of the roller N, to be divided by four strait lines into eight equal segments, as represented at P. Let the same be done at the other end of the roller, and parallel lines be drawn from one corresponding point to the other the length of the roller; mark the points with figures 1, 2, 3, 4, 5, 6, 7, 8; afterwards draw oblique lines, as from 1, at the end of O to 2, at the other end, and from 2 to 3, &c. on these oblique lines the spikes are to be fixed at equal distance in eight circles, described on the circumference of the roller. The spikes of the small roller B are fixed in the same manner, except that the diameter being smaller, there are only six instead of eight rows. R is another view of the directors, with the plank E on which they are fixed; and S is a section of a part of the plank, with one of the directors as fixed, in which may be seen the heel *m*, from whence to the point of the share *n* is a sharp cutting edge. See the same letters in figure R. At T is one of the long teeth to be seen at G; it is bent towards the roller C, which it serves to cleanse. When the end of the rake *b*, after rising above *c*, is pushed, by the motion of the arms D, D, along the upper part *e*, of the trigger F, and comes to the end beyond *a*; as it falls, the part of the arm marked *o* rests in the notch *p*, till it is again raised by the motion of the roller C with the rake. The roller C is to be one foot diameter, the spikes nine inches long, that they may go through the furrow (if the soil should be loose) into the hard earth, the more effectually to work the rake, which otherwise might be so overcharged as to cause the roller to drag without turning. In the rake-ends *b* their should be pivots, with rollers or pullers on, to go in the groove, to take off the friction; and they would likewise take the triggers more surely as the rake comes back. The rake should also be hung so far backwarder, that when it is fallen the arms of it may lie in the same plane or parallel with the directors, on which it comes up (which will require the frame to be two inches longer in the model). This will cause the rake to fall heavier, and drive the teeth into the roots, and bring them up without shattering. These teeth must be made of steel, very fine, and so long as to reach down to the plank on which the directions are fixed, that is to say, six inches long (the directors are also to be made six inches broad above the plank). The rake-head should also fall a little before the crank is at its extremity, which will cause the rake to push forward to let the teeth come into the roots. The rake-teeth must drop in the same plane with the roller and wheels, or on the surfaceof the earth. No more space should be given from the roller C to the long teeth at G G than that the rake may just miss the spikes of the roller C and fall on the places before mentioned. As the first roller B was intended to cleanse the second C more than for any other use, it may be omitted when the machine is made in large, as Mr Ogden has lately found that the long teeth at G G answer the end alone, and this renders the machine about a sixth part shorter. Now, to suit any sort of earth, there should be to each machine three planks, with directors at different spaces, to use occasionally; in the first, the spaces between the directors should be eight inches wide, in the second six, and the third four. This will answer the same end as having so many machines.

As there may be some objections to the rake not leaving the roots when it has brought them up, Mr Ogden has several methods of cleansing it; but as he would make it as simple as possible, he chooses to let it be without them at present; but suppose it should bring some roots back again with it, it will probably lose them before it gets back to the extremity; whence they will lie light, and be of but little detriment to the others coming up. Mr Ogden would have the first machine made four feet six inches wide, the teeth divided into equal spaces the outsides into half spaces.

7. The new invented Patent Universal SOWING *Machine*.

105 Universal sowing machine, Plate IX. fig. 1. 2. 11

THIS machine, whether made to be worked by hand, drawn by a horse, or fixed to a plough, and used with it, is extremely simple in the construction, and not liable to be put out of order; as there is but one movement to direct the whole, nor does it require any skill in working. It will sow wheat, barley, oats, rye, clover, cole-seed, hemp, flax, canary, rape, turnip, besides a great variety of other kinds of grain and seeds broad cast, with an accuracy hitherto unknown. It is equally useful in the new husbandry, particularly when fixed to a plough; it will then drill a more extensive variety of grain, pulse, and seed (through every gradation, with regard to quantity), and deliver each kind with greater regularity than any drill-plough whatever. When used in this manner, it will likewise be found of the utmost service to farmers who are partial to the old husbandry, as, among many other very valuable and peculiar properties, it will not only sow in the broad-cast way with a most singular exactness, but save the expence of a seedsman; the seed being sown (either over or under furrow at pleasure), and the land ploughed, at the same operation.

Perhaps a fair and decisive experiment for ascertaining the superior advantage of broad-casting or drilling any particular crop was never before so practicable; as the seed may now be put in with the utmost degree of regularity, in both methods of culture, by the same machine;

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machine; consequently, the seed will be sown in both cases with equal accuracy, without which it is impossible to make a just decision.

The excellence of this machine consists in spreading any given quantity of seed over any given number of acres, with a mathematical exactness, which cannot be done by hand; by which a great saving may be made in seeding the ground, as well as benefiting the expected crop.

There has always been a difficulty in sowing turnip seed with any degree of exactness, both from the minuteness of the seed, and the smallness of the quantity required to be sown on an acre. Here the machine has a manifest advantage, as it may be set to sow the least quantity ever required on an acre; and with an accuracy the best seedsman can never attain to.

It will also sow clover, cole, flax, and every other kind of small seed, with the utmost degree of regularity.

It will likewise broad-cast beans, pease, and tares, or drill them with the greatest exactness, particularly when constructed to be used with a plough.

Another advantage attending the use of this machine, is that the wind can have no effect on the falling of the seed.

Fig. 2

Of the Machine when made to be used without a Plough, and to be drawn by a Horse.—It may in this case be made of different lengths at the desire of the purchaser. The upper part AAAA, contains the hoppers from which the grain or seed descends into the spouts. The several spouts all rest upon a bar, which hangs and plays freely by two diagonal supporters BB; a trigger fixed to this bar bears a catch wheel: this being fixed on the axle, occasions a regular and continual motion, or jogging of the spouts, quicker or slower in proportion to the pace the person sowing with it drives; and of course, if he quickens his pace, the bar will receive a greater number of strokes from the catch wheel, and the grain or seed will feed the faster. If he drives slower, by receiving fewer strokes, the contrary must take place. In going along the side of a hill, the strength of the stroke is corrected by a spring which acts with more or less power, in proportion as the machine is more or less from a horizontal position, and counteracts the difference of gravity in the bar, so that it presses, in all situations, with a proper force against the catch wheel. This spring is unnecessary if the land be pretty level. At the bottom of the machine is placed an apron or shelf in a sloping position, and the corn or seed, by falling thereon from the spouts above, is scattered about in every direction under the machine, and covers the ground in a most regular and uniform manner.

To sow the corn or seed in drills, there are moveable spouts (see fig. 10.) which are fixed on, or taken off at pleasure, to direct the seed from the upper spout to the bottom of the furrow.

The machine is regulated for sowing any particular quantity of seed on an acre by a brass slider, A, fig. 7. fixed by screws against a brass bridge on each of the spouts. The machine is prevented from feeding while turning at the ends, by only removing the lever, E, fig. 2. out of the channel G, to another at H, on the right hand of it, which carries back the bar from the catch-wheel, and occasions the motion of the spouts to cease, and at the same time brings them upon a level by the action of the diagonal supporters; so that no corn or seed can fall from them.

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The machine in this form is particularly useful for broad-casting clover upon barley or wheat; or for sowing any other kind of seed, where it is necessary that the land should first be harrowed exceedingly fine and even.

Manner of using the Machine when drawn by a Horse.—Place the machine about two feet from the ends of the furrows where you intend it shall begin to sow. Fill the hoppers with seed, and drive it forward with the outside wheel in the first furrow. When you are at the end of the length, at the opposite side of the field, lift the lever E, fig. 2, into the channel H, and the machine will instantly stop sowing. Drive it on about two feet and then turn. Fill the hoppers again if necessary; then remove the lever back again into the channel G, and in returning, let the outside wheel of the machine go one furrow within the track which was made by it, in passing from the opposite end: as for example, if the wheel passed down the eighth furrow from the outside of the field, let it return in the seventh; and in every following length let the outside wheel always run one furrow within the tract made by the same wheel: because the breadth sown is about nine inches less than the distance between the wheels.

Let the machine be kept in a perpendicular situation. If the farmer wishes to sow more or less seed on any one part of the field than the other, it is only raising the handles a little higher, or sinking them a little lower than usual, and it will occasion a sufficient alteration; and should the last turn be less in breadth than the machine, those spouts which are not wanted may be taken up from the bar, and prevented from feeding, by turning the knob above them.

Also when the land required to be sown has what is called a *vent*, that is, when the sides of the field run in an oblique line to the furrows, which by this means are uneqnal in length: the spouts must be taken up or let down in succession by turning the knobs; as that part of the machine, where they are placed, arrives at the ends of the furrows. This is done while the machine is going forwards.

If the land be tolerably level, the machine may be fixed by the screw in the front, and the machine may then be used by any common harrow boy.

Method of regulating the Machine.—In each spout is fixed a bridge, (see fig. 7.) with an aperture in it, B, for the grain or seed to pass through. This aperture is enlarged or contracted by a slider, A, which passes over it; and when properly fixed for the quantity of seed designed to be sown on an acre, is fastened by means of two strong screws firmly against the bridge. This is made use of in sowing all kinds of seed, where it is required to sow from one bushel upwards on an acre. To sow one, two, three gallons, or any of the intermediate quantities, as of clover, cole-seed, &c. the brass plate, fig. 6. is placed between the bridge and the slider, with the largest aperture B downwards, which aperture is enlarged or contracted by the slider as before. To sow turnips, the same plate is placed between the bridge and the slider, with its smallest aperture A downwards, and the hollow part about the same aperture inwards.

Fig. 1. is a view of the regulator, by which the aperture

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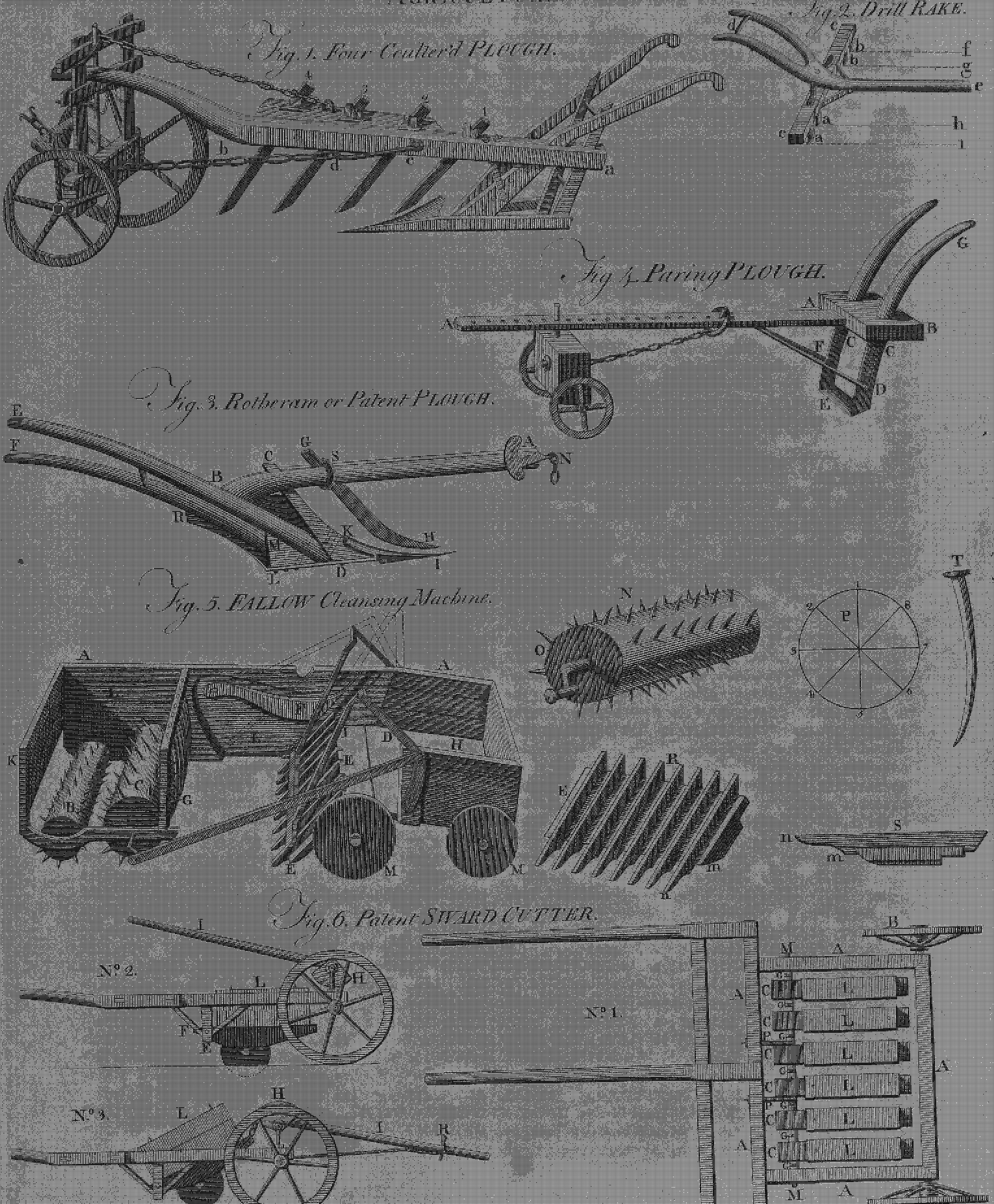

Fig. 1. Four Coulter'd PLOUGH.

Fig. 2. Drill RAKE.

Fig. 3. Rotheram or Patent PLOUGH.

Fig. 4. Paring PLOUGH.

Fig. 5. FALLOW Cleansing Machine.

Fig. 6. Patent SWARD CUTTER.

apertures in the several spouts are all set exactly alike, with the utmost ease, to make them feed equally. The extreme height of the largest aperture is equal to the breadth A B, and the breadth at C is equal to the height of the smallest aperture used, viz. that for turnips. The side AC, is divided into 60 equal parts, and on it move the slider or horse D; which being placed at any particular degree, according to the quantity of seed required to be sown on an acre, is fixed upon it, by a screw on the side of the slider or horse.

When this is done, the end of the regulator is put through the aperture in the bridge or plate (whichever is intended to be used), and the slider against the bridge in the spout, raised by it, till it stops against the horse on the regulator; then the slider is fastened against the bridge firmly by the two screws; care being taken at the same time that it stands nearly square.

By this means the spouts (being all fixed in the same manner) will feed equally.

It is easy to conceive that the size of the apertures, and consequently the quantity of seed to be sown on an acre, may be regulated with a far greater accuracy than is required in common practice.

The spouts may be regulated with the utmost nicety, in five minutes, to sow each particular seed, for the whole season. But a little practice will enable any person, who possesses but a very moderate capacity, to make the spouts feed equally, even without using the regulator (A).

Of the Machine when made to be used by Hand.—The difference of the machine in this case is, that it is made lighter, with but three spouts, without shafts, and is driven forward by the handles. It hath also a bolt in front, which being pushed in by the thumb, releases the machine; so that it can then easily be placed in a perpendicular position. This alteration is necessary to keep the handles of a convenient height, in sowing up and down a hill, where the slope is considerable; and is done while the machine is turning at the end of the length. The method of regulating and using it is the same as when made to be drawn by a horse.

Of the Machine, when constructed to be used with a Plough.—This is, without doubt the most useful application of the machine, and it can be fixed without difficulty to any kind of plough, in the same manner as to that represented fig. 1.

The advantages arising from the use of it are great and numerous; for, beside the increase in the crop, which will be insured by the seeds being broad-cast with a mathematical nicety, a large proportion of seed (the value of which alone, in a few months, will amount to more than the price of the machine) and the seedsman's labour will be saved. The seed may likewise be sown either under or over furrow; or one cast each way, as is practised by some farmers. The seed also, being cast by the machine upon the fresh ploughed land, may be immediately harrowed in, before the mould has lost any part of its moisture; which in a dry season will greatly promote the crop. In drilling any kind of grain, pulse, or seed, it possesses every property that can be wished for in the best drill-plough, nor will it (as most of them do) bruise the seed, or feed irregularly. The construction of the machine is the same as the large ones, except being made with one hopper and spout instead of several, and the apron moveable instead of being fixed, as may be seen by inspecting fig. 4. The only alteration necessary to make the machine broad-cast or drill is, in the former case to place the apron B, fig. 1. at the bottom of the machine, upon the hooks FF, sloping either towards the furrows or the imploughed land, according as it is intended to sow the seed, either under or over furrow. Whenever the apron is required to be shifted, it is done in less than a second of time; as it only requires to be moved up or down with the hand, when a catch fixes it.

To prepare it for drilling, instead of the apron, place the long spout, fig. 10, upon the brackets, on the front of the machine, by the ears AA, to receive the seed from the upper spout, and fasten the lower end of it, by a small cord, to that hook upon which the apron is hung for broad-casting, which is next the plough (see fig. 3;) the seed will then be directed by the long spout, to the centre of the furrow, near the heel of the plough. The spring for correcting the strength of the stroke, is necessary only when they are required to go along the side of a considerable declivity. The machine, when fixed to a plough, does not require the smallest degree of skill in using, as nothing is necessary but to keep the hopper filled, which will contain a sufficient quantity of seed to go upwards of 140 rods, before it will want re-filling, when three bushels and a half are sown on an acre. The accuracy with which it will broad-cast, may in some measure be conceived, by considering that the seed regularly descends upon the apron or shelf, and is from thence scattered upon the ground, in quantity exactly proportioned to the speed of the plough: also that each cast spreads to the third furrow; and by this means shuts upon the last. In this manner it is continually filling up till the whole field is completely covered; so that it is impossible to leave the smallest space without its proper quantity of seed.

When the plough is wanted for any other purpose, the

(A) Proper directions are given with each machine for using it, as also for fixing the sliders to sow any particular quantity of corn or seed on an acre, so as to enable any person to set the spouts.

The prices of the machine (exclusive of the packing cases) are as follow. If constructed to be used with a single furrow plough; the wheel, with the axle and cheeks steeled, strap, regulator, brass-plates for broad-casting or drilling turnips, lucerne, tares, wheat, barley, &c. &c. &c. and every article necessary for fixing it included, three guineas and a half. If made with a spring (for sowing on the side of a hill, where the slope is considerable), but which is very rarely necessary, five shillings more. If made to be fixed to any double-furrow plough, four guineas and a half.

The large machine, fig. 2. when made to broad-cast seven furrows at a time, and to be drawn by a horse, eight guineas and a half. If constructed to sow five furrows at a time, and to be used by hand, six guineas. These are also five shillings more if made with a spring.

the machine, with the wheel at the heel of the plough for giving it motion, can be removed or replaced at any time in five minutes.

Fig. 11. repreſents the machine fixed to a double furrow creaſing plough, and prepared for drilling. As this plough may not be generally known, it will not be improper to obſerve, that it is chiefly uſed for creaſing the land with furrows (after it has been once ploughed and harrowed); which method is neceſſary when the ſeed is to be ſown broad-caſt upon land that has been a clover-lay, &c. becauſe, if the ſeed be ſown upon the rough furrows, a conſiderable part of it will fall between them, and be unavoidably loſt, by laying to deep buried in the earth. This mode anſwers extremely well, and partakes of both methods of culture; the ſeed, though ſown broad-caſt, falling chiefly into the furrows.

The machine is very uſeful for ſowing in this manner; as the ſeed is broad-caſt, with an inconceivable regularity, at the time the land is creaſed. The advantages it likewiſe poſſeſſes for drilling all ſorts of grain or ſeed with this plough, are too evident to need mentioning.

The machine, when conſtructed to be uſed with a double-furrow plough, is made with two upper and two long ſpouts for drilling, two aprons for broad-caſting, and with a double hopper; but in other reſpects the ſame as when intended for a ſingle furrow plough: it is uſed in all caſes with the greateſt eaſe imaginable.

The interval between the points of the two ſhares of a creaſing plough is uſually ten inches; the beam about nine feet long; and the whole made of a light conſtruction.

Plate IX. *A more particular explanation of the figures.*—Fig. 1. The machine fixed to a Kentiſh turn wreſt plough. A, The machine. B, the apron upon which the ſeed falls and rebounds upon the land, in broad-caſting. C, Lid to cover the hopper. D, Wheel at the heel of the plough. E, ſtrap. FF, Hooks upon which the apron turns by a pivot on each ſide. G, Stays, to keep the machine ſteady. H, Lever to prevent it from ſowing.

Fig. 2. The machine conſtructed to be drawn by a horſe. AAAA, The hoppers. BB, The diagonal ſupporters. CCCC, The upper ſpouts. D, The apron or ſhelf upon which the ſeed falls from the upper ſpouts. E, The lever, which carries back the bar, and prevents the machine from ſowing. FF, Staples upon the handles, through which the reins paſs, for the man who conducts the machine, to direct the horſe by. I, Screw to fix the machine occaſionally. N. B. The knobs (by turning which each particular ſpout may be taken from off the bar, and thereby prevented from feeding) are over each upper ſpout; but, to prevent confuſion, are not lettered in the Plate.

Fig. 3. Is the ſame machine with that in fig. 1. The dotted lines, expreſſing the ſituation of the long ſpout, when the apron is removed, and the machine adapted for drilling.

Fig. 4. Alſo the ſame machine, with the front laid open to ſhow the inſide. A, The catch-wheel fixed upon the axle. BB, The axle upon which the machine hangs between the handles of the plough. C, The pulley, by which the ſtrap from the wheel at the heel of the plough turns the catch-wheel. D, The bar, upon which the upper ſpout reſts, ſuſpended by the diagonal ſupporters EE, bearing againſt the catch-wheel by the trigger F, and thereby kept in motion while the plough is going. G, the apron in a ſloping poſition, upon which the corn or ſeed falls from the upper ſpout, and is ſcattered by rebounding upon the land. It turns upon pivots, and by this means throws the ſeed either towards the right hand or left at pleaſure.

Fig. 5. The upper ſpout.

Fig. 6. The plate which is placed between the bridge and the ſlider for ſowing ſmall ſeeds. The aperture A being downwards for ſowing turnips; the larger one B downwards for ſowing clover, &c.

Fig. 7. The bridge, fixed in the upper ſpouts. A, The ſlider, which contracts or enlarges the different apertures. B, the aperture in the bridge, through which the ſeed paſſes, when ſowing any quantity from one buſhel upwards on an acre.

Fig. 8. The regulator made of braſs. D, The ſlider or horſe which moves upon it, and is fixed at any particular degree by a ſcrew in its ſide.

Fig. 9. Repreſents the movement in the machine fig. 2. AAAA. Cleets, between which the upper ſpouts reſt. BB, The diagonal ſupporters by which the bar with the upper ſpouts hang. C, The catch-wheel. DD, the axle. E, The trigger upon the bar, which bears againſt the catch-wheel. FF, Stays from the back of the machine, by which the bar plays.

Fig. 10. The long ſpout. AA, The ears by which it hangs.

Sect. II. *Preparing Land for Cropping.*

1. Obstructions to Cropping.

In preparing land for cropping, the firſt thing that occurs, is to conſider the obſtructions to regular ploughing. The moſt formidable of theſe, are *ſtones* lying above or below the ſurface, which are an impediment to a plough, as rocks are to a ſhip. Stones above the ſurface may be avoided by the ploughman, though not without loſs of ground: but ſtones below the ſurface are commonly not diſcovered till the plough be ſhattered to pieces, and perhaps a day's work loſt. The clearing land of ſtones is therefore neceſſary to prevent miſchief. And to encourage the operation, it is attended with much actual profit. In the firſt place, the ſtones are uſeful for fences: when large they muſt be blown, and commonly fall into parts proper for building. And as the blowing, when gunpowder is furniſhed, does not exceed a halfpenny for each inch that is bored, theſe ſtones come generally cheaper than to dig as many out of the quarry. In the next place, as the ſoil round a large ſtone is commonly the beſt in the field, it is purchaſed at a low rate by taking out the ſtone. Nor is this a trifle; for not only is the ground loſt that is occupied by a large ſtone, but alſo a conſiderable ſpace round it, to which the plough has not acceſs without danger. A third advantage is greater than all the reſt; which is, that the ploughing can be carried on with much expedition, when there is no apprehenſion of ſtones: in ſtony land, the plough muſt proceed ſo ſlow as not to perform half of its work.

106 Obſtructions, *viz.*
107 Stones.

To clear land of ſtones, is in many inſtances an undertaking

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dertaking too expensive for a tenant who has not a very long lease. As it is profitable both to him and to his landlord, it appears reasonable that the work should be divided, where the lease exceeds not nineteen years. It falls naturally upon the landlord to be at the expence of blowing the stones, and upon the tenant to carry them off the field.

108 Wetness. Another obstruction is *wet ground*. Water may improve gravelly or sandy soils; but it sours (A) a clay soil, and converts low ground into a morass, unfit for any purpose that can interest the husbandman.

A great deal has been written upon different methods of draining land, mostly so expensive as to be scarce fit for the landlord, not to mention the tenant.

One way of draining without expence when land is to be inclosed with hedge and ditch, is to direct the ditches so as to carry off the water. But this method is not always practicable, even where the divisions lie convenient for it. If the run of water be considerable, it will destroy the ditches, and lay open the fences, especially where the soil is loose or sandy.

If ditches will not answer, hollow drains are sometimes made, and sometimes open drains, which must be made so deep as to command the water. The former is filled up with loose stones, with brush-wood, or with any other porous matter that permits the water to pass. The latter is left open, and not filled up. To make the former effectual, the ground must have such a slope as to give the water a brisk course. To execute them in level ground is a gross error: the passages are soon stopped up with sand and sediment, and the work is rendered useless. This inconvenience takes not place in open drains; but they are subject to other inconveniences: They are always filling up, to make a yearly reparation necessary; and they obstruct both ploughing and pasturing.

The following is the best in all views. It is an open drain made with the plough, cleaving the space intended for the drain over and over, till the furrow be made of a sufficient depth for carrying off the water. The slope on either side may, by repeated ploughings, be made so gentle as to give no obstruction either to the plough or to the harrow. There is no occasion for a spade, unless to smooth the sides of the drain, and to remove accidental obstructions in the bottom. The advantages of this drain are manifold. It is executed at much less expence than either of the former; and it is perpetual, as it can never be obstructed. In level ground, it is true, grass may grow at the bottom of the drain; but to clear off the grass once in four or five years, will restore it to its original perfection. A hollow drain may be proper between the spring-head and the main drain, where the distance is not great; but in every other case the drain recommended is the best.

Where a level field is infested with water from higher ground, the water ought to be intercepted by a ditch carried along the foot of the high ground, and terminating in some capital drain.

The only way to clear a field of water that is hollow in the middle, is to carry it off by some drain still lower. This is commonly the case of a morass fed with water from higher ground, and kept on the surface by a clay bottom.

A clay soil of any thickness is never pestered with springs; but it is pestered with rain, which settles on the surface as in a cup. The only remedy is high narrow ridges, well rounded. And to clear the furrows, the furrow of the foot-ridge ought to be considerably lower, in order to carry off the water cleverly. It cannot be made too low, as nothing hurts clay soil more than the stagnation of water on it; witness the hollows at the end of crooked ridges, which are absolutely barren. Some gravelly soils have a clay bottom; which is a substantial benefit to a field when in grass, as it retains moisture. But when in tillage, ridges are necessary to prevent rain from settling at the bottom; and this is the only case where a gravelly soil ought to be ridged.

Clay soils that have little or no level, have sometimes a gravelly bottom. For discharging the water, the best method is, at the end of every ridge to pierce down to the gravel, which will absorb the water. But if the furrow of the foot-ridge be low enough to receive all the water, it will be more expeditious to make a few holes in that furrow. In some cases, a field may be drained, by filling up the hollows with earth taken from higher ground. But as this method is expensive, it will only be taken where no other method answers. Where a field happens to be partly wet, partly dry, there ought to be a separation by a middle ridge, if it can be done conveniently; and the dry part may be ploughed while the other is drying.

The low part of Berwickshire is generally a brick clay, extremely wet and poachy during winter. This in a good measure may be prevented by proper inclosing, as there is not a field but can be drained into lower ground all the way down to the river Tweed. But as this would lessen the quantity of rain in a dry climate, such as is all the east side of Britain, it may admit of some doubt whether the remedy would not be as bad as the disease. (*See the article* Draining.)

2. Bringing into CULTURE, LAND from the STATE of NATURE.

To improve a moor, let it be opened in winter when it is wet; which has one convenience, that the plough cannot be employed at any other work. In spring, after frost is over, a slight harrowing will fill up the seams with mould, to keep out the air, and rot the sod. In that state let it lie the following summer and winter, which will rot the sod more than if laid open to the air by ploughing. Next April, let it be cross-ploughed, braked, and harrowed, till it be sufficiently pulverised. Let the manure laid upon it, whether lime or dung, be intimately mixed with the soil by repeated harrowings. This will make a fine bed for turnip-seed if sown broad-cast. But if drills be intended, the method must be 109 Moorish ground.

(A) By this expression it is not meant that the ground really becomes acid, but only that it becomes unfit for the purposes of vegetation. The natural products of such a soil are rushes and *sour grass*: which last appears in the furrows, but seldom in the crown of the ridge; is dry and tasteless like a chip of wood; and feels rough when stroked backwards.

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be followed that is directed afterward in treating more directly of the culture of turnip.

A successful turnip-crop, fed on the ground with sheep, is a fine preparation for laying down a field with grass-seeds. It is an improvement upon this method, to take two or three successive crops of turnip, which will require no dung for the second and following crops. This will thicken the soil, and enrich it greatly.

110 Swampy ground.

The best way of improving swampy ground after draining, is paring and burning. But where the ground is dry, and the soil so thin as that the surface cannot be pared, the best way of bringing it into tilth from the state of nature, as mentioned above, is to plough it with a feathered sock, laying the grassy surface under. After the new surface is mellowed with frost, fill up all the seams by harrowing cross the field, which by excluding the air will effectually rot the sod. In this state let it lie summer and winter. In the begining of May after, a cross ploughing will reduce all to small square pieces, which must be pulverized with the brake, and make it ready for a May or June crop. If these square pieces be allowed to lie long in the sap without breaking, they will become tough and not be easily reduced.

3. Forming Ridges.

111 Of ridges.

The first thing that occurs on this head, is to consider what grounds ought to be formed into ridges, and what ought to be tilled with a flat surface. Dry soils, which suffer by a lack of moisture, ought to be tilled flat, which tends to retain moisture. And the method for such tilling, is to go round and round from the circumference to the centre, or from the centre to the circumference. This method is advantageous in point of expedition, as the whole is finished without once turning the plough. At the same time, every inch of the soil is moved, instead of leaving either the crown or the furrow unmoved, as is commonly done in tilling ridges. Clay soil, which suffers by water standing on it, ought to be laid as dry as possible by proper ridges. A loamy soil is the middle between the two mentioned. It ought to be tilled flat in a dry country, especially if it incline to the soil first mentioned. In a moist country, it ought to be formed into ridges, high or low according to the degree of moisture and tendency to clay.

In grounds that require ridging, an error prevails, that ridges cannot be raised too high. High ridges labour under several disadvantages. The soil is heaped upon the crown, leaving the furrows bare: the crown is too dry, and the furrows too wet: the crop, which is always best on the crown, is more readily shaken with the wind, than where the whole crop is of an equal height: the half of the ridge is always covered from the sun, a disadvantage which is far from being slight in a cold climate. High ridges labour under another disadvantage in ground that has no more level than barely sufficient to carry off water: they sink the furrows below the level of the ground; and consequently retain water at the end of every ridge. The furrows ought never to be sunk below the level of the ground. Water will more effectually be carried off by lessening the ridges both in height and breadth: a narrow ridge, the crown of which is but 18 inches higher than the furrow, has a greater slope than a very broad ridge where the difference is three or four feet.

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Next, of forming ridges where the ground hangs considerably. Ridges may be too steep as well as too horizontal; and if to the ridges be given all the steepness of a field, a heavy shower may do irreparable mischief. To prevent such mischief, the ridges ought to be so directed cross the field, as to have a gentle slope for carrying off water slowly, and no more. In that respect, a hanging field has greatly the advantage of one that is nearly horizontal; because in the latter, there is no opportunity of a choice in forming the ridges. A hill is of all the best adapted for directing the ridges properly. If the soil be gravelly, it may be ploughed round and round, beginning at the bottom and ascending gradually to the top in a spiral line. This method of ploughing a hill, requires no more force than ploughing on a level; and at the same time removes the great inconvenience of a gravelly hill, that rains go off too quickly; for the rain is retained in every furrow. If the soil be such as to require ridges, they may be directed to any slope that is proper.

In order to form a field into ridges, that has not been formerly cultivated, the rules mentioned are easily put in execution. But what if ridges be already formed, that are either crooked or too high? After seeing the advantage of forming a field into ridges, people were naturally led into an error, that the higher the better. But what could tempt them to make their ridges crooked? Certainly this method did not originate from design; but from the laziness of the driver suffering the cattle to turn too hastily, instead of making them finish the ridge without turning. There is more than one disadvantage in this slovenly practice. First, the water is kept in by the curve at the end of every ridge, and sours the ground. Next, as a plough has the least friction possible in a straight line, the friction must be increased in a curve, the back part of the mouldboard pressing hard on the one hand, and the coulter pressing hard on the other. In the third place, the plough moving in a straight line, has the greatest command in laying the earth over. But where the straight line of the plough is applied to the curvature of a ridge in order to heighten it by gathering, the earth moved by the plough is continually falling back, in spite of the most skilful ploughman.

The inconveniences of ridges high and crooked are so many, that one would be tempted to apply a remedy at any risk. And yet, if the soil be clay, it would not be adviseable for a tenant to apply the remedy upon a lease shorter than two nineteen years. In a dry gravelly soil, the work is not difficult nor hazardous. When the ridges are cleaved two or three years successively in the course of cropping, the operation ought to be concluded in one summer. The earth, by reiterated ploughings, should be accumulated upon the furrows, so as to raise them higher than the crowns: they cannot be raised too high, for the accumulated earth will subside by its own weight. Cross-ploughing once or twice, will reduce the ground to a flat surface, and give opportunity to form ridges at will. The same method brings down ridges in clay soil; only let care be taken to carry on the work with expedition; be-

cause

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cause a hearty shower, before the new ridges are formed, would soak the ground in water, and make the farmer suspended his work for the remainder of that year at least. In a strong clay, we would not venture to alter the ridges, unless it can be done to perfection in one season.—On this subject Mr Anderson has the following observations*.

* *Essays on Agriculture.* Vol. I. p. 146.

112 Inconveniences in the common methods of levelling.

"The difficulty of performing this operation properly with the common implements of husbandry, and the obvious benefit that accrues to the farmer from having his fields level, has produced many new inventions of ploughs, harrows, drags, &c. calculated for speedily reducing the fields to that state; none of which have as yet been found fully to answer the purpose for which they were intended, as they all indiscriminately carry the earth that was on the high places into those that were lower; which although it may, in some cases render the surface of the ground tolerably smooth and level, is usually attended with inconveniences far greater, for a considerable length of time, than that which it was intended to remove.

113 Vegetable mould becomes inert by being long buried

"For experience sufficiently shows, that even the best vegetable mould, if buried for any length of time so far beneath the surface as to be deprived of the benign influences of the atmosphere, loses its *vis vitæ*, if I may be allowed that expression; becomes an inert, lifeless mass, little fitted for nourishing vegetables, and constitutes a soil very improper for the purposes of the farmer. It therefore behoves him, as much as in him lies, to preserve, on every part of his fields, an equal covering of that vegetable mould that has long been uppermost, and rendered fertile by the meliorating influence of the atmosphere. But, if he suddenly levels his high ridges by any of these mechanical contrivances, he of necessity buries all the good mould that was on the top of the ridges in the old furrows; by which he greatly impoverishes one part of his field, while he too much inriches another; insomuch that it is a matter of great difficulty, for many years thereafter, to get the field brought to an equal degree of fertility in different places; which makes it impossible for the farmer to get an equal crop over the whole of his field by any management whatever: and he has the mortification frequently, by this means, to see the one half of his crop rotted by an over-luxuriance, while other parts of it are weak and sickly, or one part ripe and ready for reaping, while the other is not properly filled; so that it were, on many occasions, better for him to have his whole field reduced at once to the same degree of poorness as the poorest of it, than have it in this state. An almost impracticable degree of attention in spreading the manures may indeed in some measure get the better of this; but it is so difficult to perform this properly, that I have frequently seen fields that had been thus levelled, in which, after thirty years of continued culture and repeated dressings, the marks of the old ridges could be distinctly traced when the corn was growing, altho' the surface was so level that no traces of them could be perceived when the corn was off the ground.

"But this is a degree of perfection in levelling that cannot be usually attained by following this mode of practice; and, therefore, is but seldom seen. For all that can be expected to be done by any levelling machine, is to render the surface perfectly smooth and even in every part, at the time that the operation is performed: but as, in this case, the old hollows are suddenly filled up with loose mould to a great depth, while the earth below the surface upon the heights of the old ridges remains firm and compact, the new-raised earth after a short time subsides very much, while the other parts of the field do not sink at all; so that in a short time the old furrows come to be again below the level of the other parts of the field, and the water of course is suffered in some degree to stagnate upon them; in so much that, in a few years, it becomes necessary once more to repeat the same levelling process, and thus renew the damage that the farmer sustains by this pernicious operation.

114 Levelling sometimes not to be attempted.

"On these accounts, if the farmer has not a long lease, it will be found in general to be much his interest to leave the ridges as he found them, rather than to attempt to alter their direction: and, if he attends with due caution to moderate the height of these old ridges, he may reap very good crops, although perhaps at a somewhat greater expence of labour than he would have been put to upon the same field, if it had been reduced to a proper level surface, and divided into straight and parallel ridges.

"But, where a man is secure of possessing his ground for any considerable length of time, the advantages that he will reap from having level and well laid-out fields, are so considerable as to be worth purchasing, if it should even be at a considerable expence. But the loss that is sustained at the beginning, by this mechanical mode of levelling ridges, if they are of considerable height, is so very great, that it is perhaps doubtful if any future advantages can ever fully compensate it. I would therefore advise, that all this levelling apparatus should be laid aside; and the following more efficacious practice be substituted in its stead: A practice that I have long followed with success, and can safely recommend as the very best that has yet come to my knowledge.

115 Best method of levelling.

"If the ridges have been raised to a very great height, as a preparation for the ensuing operations, they may be first *cloven*, or *scaled* out, as it is called in different places; that is, ploughed so as to lay the earth on each ridge from the middle towards the furrows. But, if they are only of a moderate degree of height, this operation may be omitted. When you mean to proceed to level the ground, let a number of men be collected, with spades, more or fewer as the nature of the ground requires, and then set a plough to draw a furrow directly across the ridges of the whole field intended to be levelled. Divide this line into as many parts as you have labourers, allotting to each one ridge or two, or more or less, according to their number, height, and other circumstances. Let each of the labourers have orders, as soon as the plough has passed that part assigned him, to begin to dig in the bottom of the furrow that the plough has just made, about the middle of the side of the old ridge, keeping his face towards the old furrow, working backwards till he comes to the height of the ridge, and then turn towards the other furrow, and repeat the same on the other side of the ridge, always throwing the earth that he digs up into the deep old furrow between the ridges,

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ges, that is directly before him; taking care not to dig deep where he first begins, but to go deeper and deeper as he advances to the height of the ridge, so as to leave the bottom of the trench he thus makes across the ridge entirely level, or as nearly so as possible. And when he has finished that part of the furrow allotted to him that the plough has made in going, let him then go and finish in the same manner his own portion of the furrow that the plough makes in returning. In this manner, each man performs his own task through the whole field, gradually raising the old furrows as the old heights are depressed. And, if an attentive overseer is at hand, to see that the whole is equally well done, and that each furrow is raised to a greater height than the middle of the old ridges, so as to allow for the subsiding of the loose earth, the operation will be entirely finished at once, and never again need to be repeated.

"In performing this operation, it will always be proper to make the ridges, formed for the purpose of levelling, which go across the old ridges, as broad as possible; because the deep trench that is thus made in each of the furrows is an impediment in the future operations, as well as the height that is accumulated in the middle of each of these ridges; so that the fewer there are of these, the better it is. The farmer, therefore, will do well to advert to this in time, and begin by forming a ridge by always turning the plough to the right hand, till it becomes of such a breadth as makes it very inconvenient to turn longer in that manner; and then, at the distance of twice the breadth of this new-formed ridge from the middle of it, mark off a furrow for the middle of another ridge, turning round it to the right hand, in the same manner as was done in the former, till it becomes of the same breadth with it; and then, turning to the left hand, plough out the interval that was left between the two new-formed ridges. By this mode of ploughing, each ridge may be made of 40, or 50 or 60 yards in breadth, without any great inconvenience; for although some time will be lost in turning at the ends of these broad ridges, yet, as this operation is only to be once performed in this manner, the advantage that is repeated by having few open furrows, is more than sufficient to counterbalance it. And, in order to moderate the height that would be formed in the middle of each of these great ridges, it will always be proper to mark out the ridges, and draw the furrow that is to be the middle of each some days before you collect your labourers to level the field; that you may, without any hurry or loss of labour, clear out a good trench through the middle of each of the old ridges; as the plough at this time going and returning nearly in the same track, prevents the labourers from working properly without this precaution.

"If these rules are attended to, your field will be at once reduced to a proper level, and the rich earth that formed the surface of the old ridges be still kept upon the surface of your field; so that the only loss that the possessor of such ground can sustain by this operation, is merely the expence of performing it."

He afterwards makes a calculation of the different expences of levelling by the plough and by the spade, in which he finds the latter by far the cheapest method.

116 Proper direction of the ridges.

Let it be a rule, to direct the ridges north and south, if the ground will permit. In this direction the east and west sides of the ridges, dividing the sun equally between them, will ripen at the same time.

117 Narrow ridges an advantage.

It is a great advantage in agriculture, to form ridges so narrow, and so low, as to admit the crowns and furrows to be changed alternately every crop. The soil nearest the surface is the best; and by such ploughing, it is always kept near the surface, and never buried. In high ridges, the soil is accumulated at the crown and the furrows left bare. Such alterations of crown and furrow, is easy where the ridges are no more but seven or eight feet broad. This mode of ploughing answers perfectly well in sandy and gravelly soils, and even in loam; but it is not safe in clay soil. In that soil, the ridges ought to be 12 feet wide, and 20 inches high; to be preserved always in the same form by casting, that is, by ploughing two ridges together, beginning at the furrow that separates them, and ploughing round and round till the two ridges be finished. By this method, the separating furrow is raised a little higher than the furrows that bound the two ridges. But at the next ploughing, that inequality is corrected, by beginning at the bounding furrows, and going round and round till the ploughing of the two ridges be completed at the separating furrow.

4. Clearing Ground of Weeds.

118 Cleaning harrow. Plate V. fig. 6.

For this purpose a new instrument, termed a *cleaning harrow*, has been introduced by Lord Kames, and is strongly recommended (B). It is one entire piece like the first of those mentioned above, consisting of seven bulls, four feet long each, two and one-fourth inches broad, two and three-fourths deep. The bulls are united together by sheths, similar to what are mentioned above. The intervals between the bulls being three and three-fourths inches, the breadth of the whole harrow is three feet five inches. In each bull are inserted eight teeth, each nine inches free below the wood, and distant from each other six inches. The weight of each tooth is a pound, or near it. The whole is firmly bound by an iron plate from corner to corner in the line of the draught. The rest as in the harrows mentioned above. The size, however, is not invariable. The cleaning harrow ought to be larger or less according as the soil is stiff or free.

To give this instrument its full effect, stones of such a size as not to pass freely between the teeth ought to be carried off, and clods of that size ought to be broken. The ground ought to be dry, which it commonly is in the month of May.

In preparing for barley, turnip, or other summer-crop, begin with ploughing and cross-ploughing. If the ground be not sufficiently pulverized, let the great brake be applied, to be followed successively with the 1st and 2d harrows. In stiff soil, rolling may be proper, or twice between the acts. These operations will loosen every root, and bring some of them to the surface. This

Plate VI. fig. 3, 4.

(B) In his *Gentleman Farmer*; to which performance the practical part of this article is materially indebted.

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This is the time for the 3d harrow, conducted by a boy mounted on one of the horses, who trots smartly along the field, and brings all the roots to the surface: there they are to lie for a day or two, till perfectly dry. If any stones or clods remain, they must be carried off in a cart. And now succeeds the operation of the cleaning harrow. It is drawn by a single horse, directed by reins, which the man at the opposite corner puts over his head, in order to have both hands free. In this corner is fixed a rope, with which the man from time to time raises the harrow from the ground, to let the weeds drop. For the sake of expedition, the weeds ought to be dropt in a straight line cross the field, whether the harrow be full or not; and seldom is a field so dirty but that the harrow may go 30 yards before the teeth are filled. The weeds will be thus laid in parallel rows, like those of hay raked together for drying. A harrow may be drawn swiftly along the rows, in order to shake out all the dust; and then the weeds may be carried clean off the field in carts. But we are not yet done with these weeds: instead of burning, which is the ordinary practice, they may be converted into useful manure, by laying them in a heap with a mixture of hot dung to begin fermentation. At first view, this way of cleaning land will appear operose; but upon trial, neither the labour nor expence will be found immoderate. At any rate, the labour and expence ought not to be grudged; for if a field be once thoroughly cleaned, the seasons must be very cross, or the farmer very indolent, to make it necessary to renew the operation in less than 20 years. In the worst seasons, a few years pasture is always under command; which effectually destroys triennial plants, such as thistles and couch-grass.

5. On the Nature of different kinds of Soils, and the Plants proper to each.

1. Clay, which is in general the stiffest of all soils, and contains an unctuous quality. But under the term *clays*, earths of different sorts and colours are included. One kind is so obstinate, that scarcely any thing will subdue it; another is so hungry and poor, that it absorbs whatever is applied, and turns it into its own quality. Some clays are fatter than others, and the fattest are the best; some are more soft and slippery. But all of them retain water poured on their surfaces, where it stagnates, and chills the plants, without sinking into the soil. The closeness of clay prevents the roots and fibres of plants from spreading in search of nourishment. The blue, the red, and the white clay, if strong, are unfavourable to vegetation. The stony and looser sort are less so; but none of them are worth any thing till their texture is so loosened by a mixture of other substances, and opened, as to admit the influence of the sun, the air, and frosts. Among the manures recommended for clay, sand is of all others to be preferred; and sea-sand the best of all where it can be obtained: This most effectually breaks the cohesion.

The reason for preferring sea-sand is, that it is not formed wholly (as most other sands are) of small stones; but contains a great deal of calcareous matter in it, such as, shells grated and broken to pieces by the tide; and also of salts. The smaller the sand is the more easily it penetrates the clay; but it abides less time in it than the larger.

The next best sand is that washed down by rains on gravelly soils. Those which are dry and light are the worst. Small gritty gravel has also been recommended by the best writers on agriculture for these soils; and in many instances we have found them to answer the purpose.

Shell-marle, ashes, and all animal and vegetable substances, are very good manures for clay; but they have been found most beneficial when sand is mixed with them. Lime has been often used, but the writer of this section would not recommend it, for he never found any advantage from it singly, when applied to clays.

The crops most suitable for such lands are, wheat, beans, cabbages, and rye-grass. Clover seldom succeeds, nor indeed any plants whose roots require depth, and a wide spread in the earth.

2. Chalk. Chalky sails are generally dry and warm, and if there be a tolerable depth of mould, fruitful; producing great crops of barley, rye, pease, vetches, clover, trefoil, burnet, and particularly sain-foin. The latter plant flourishes in a chalky soil better than any other. But if the surface of mould be very thin, this soil requires good manuring with clay, marle, loam, or dung. As these lands are dry, they may be sown earlier than others.

When your barley is three inches high, throw in 10 ℔. of clover, or 15 lb. of trefoil, and roll it well. The next summer mow the crop for hay; feed off the aftermath with sheep; and in winter give it a top-dressing of dung. This will produce a crop the second spring, which should be cut for hay. As soon as this crop is carried off, plough up the land, and in the beginning of September sow three bushels of rye per acre, either to feed off the sheep in the spring or to stand for harvest. If you feed it off, sow winter vetches in August or September, and make them into hay the following summer. Then get the land into as fine tilth as possible, and sow it with sain-foin, which, with a little manure once in two or three years, will remain and produce good crops for 20 years together.

3. Light poor land, which seldom produces good crops of any thing till well manured. After it is well ploughed, sow three bushels of buck-wheat per acre, in April or May: When in bloom, let your cattle in a few days to eat off the best, and tread the other down; this done, plough in what remains immediately. This will soon ferment and rot in the ground; then lay it fine, and sow three bushels of rye per acre. If this can be got off early enough, sow turnips; if not, winter vetches to cut for hay. Then get it in good tilth and sow turnip-rooted cabbages, in rows three feet apart. This plant seldom fails, if it has sufficient room, and the intervals be well horse-hoed; and you will find it the best spring-feed for sheep when turnips are over.

The horse-hoeing will clean and prepare the land for sain-foin; for the sowing of which April is reckoned the best season. The usual way is to sow it broad-cast, four bushels to an acre; but the writer prefers sowing it in drills two feet asunder; for then it may be horse-hoed, and half the seed will be sufficient.

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The horse-hoeing will not only clean the crop, but earth up the plants, and render them more luxuriant and lasting.

If you sow it broad-cast, give it a top-dressing in December or January, of rotten dung, or ashes, or which is still better, of both mixed up in compost.

From various trials, it is found that taking only one crop in a year, and feeding the after-growth, is better than to mow it twice. Cut it as soon as it is in full bloom, if the weather will permit. The hay will be the sweeter, and the strength of the plants less impaired, than if it stands till the seed is formed.

4. Light rich land, being the most easy to cultivate to advantage, and capable of bearing most kinds of grain, pulse, and herbage, little need be said upon it. One thing however is very proper to be observed, that such lands are best adapted to the drill husbandry, especially where machines are used, which require shallow furrows to be made for the reception of the seed. This, if not prone to couch-grass, is the best of all soils for lucerne; which, if sown in two feet drills, and kept clean, will yield an astonishing quantity of the most excellent herbage. But lucerne will never be cultivated to advantage where couch-grass and weeds are very plentiful; nor in the broad-cast method, even where they are not so; because horse-hoeing is essential to the vigorous growth of this plant.

5. Coarse rough land. Plough deep in autumn; when it has lain two weeks, cross-plough it, and let it lie rough through the winter. In March give it another good ploughing; drag, rake, and harrow it well, to get out the rubbish, and sow four bushels of black oats per acre if the soil be wet, and white oats if dry. When about four inches high, roll them well after a shower: This will break the clods; and the fine mould falling among the roots of the the plants will promote their growth greatly.

Some sow clover and rye grass among the oats, but this appears to be bad husbandry. If you design it for clover, sow it single, and let a coat of dung be laid on in December. The snow and rain will then dilute its salts and oil, and carry them down among the roots of the plants. This is far better than mixing the crops on such land, for the oats will exhaust the soil so much that the clover will be impoverished. The following summer you will have a good crop of clover, which cut once, and feed the after-growth. In the winter plough it in, and let it lie till February: Then plough and harrow it well; and in March, if the soil be moist, plant beans in drills of three feet, to admit the horse-hoe freely. When you horse-hoe them a second time, sow a row of turnips in each interval, and they will succeed very well. But if the land be strong enough for sowing wheat as soon as the beans are off, the turnips may be omitted.

Sect. III. *Culture of particular Plants.*

119 The articles hitherto insisted on, are all of them preparatory to the capital object of a farm, that of raising plants for the nourishment of man, and of other animals. These are of two kinds; culmiferous and leguminous; differing widely from each other. Wheat, rye, barley, oats, rye-grass, are of the first kind: of the other kind are, pease, beans, clover, cabbage, and many others.

120 Culmiferous plants.

Culmiferous plants, says Bonnet, have three sets of roots. The first issue from the seed, and push to the surface an upright stem; another set issue from a knot in that stem; and a third from another knot, nearer the surface. Hence the advantage of laying seed so deep in the ground as to afford space for all the sets.

121 Leguminous plants.

Leguminous plants form their roots differently. Pease, beans, cabbage, have store of small roots, all issuing from the seed, like the undermost set of culmiferous roots; and they have no other roots. A potato and a turnip have bulbous roots. Red clover has a strong tap-root. The difference between culmiferous and leguminous plants with respect to the effects they produce in the soil, will be insisted on afterward, in the section concerning the rotation of crops. As the present section is confined to the propagation of plants, it falls naturally to be divided into three articles: first, Plants cultivated for fruit; second, Plants cultivated for roots; third, Plants cultivated for leaves.

I. Plants Cultivated for Fruit.

1. Wheat and Rye.

122 Fallowing for wheat.

Any time from the middle of April to the middle of May, the fallowing for wheat may commence. The moment should be chosen, when the ground, beginning to dry, has yet some remaining softness: in that condition, the soil divides easily by the plough, and falls into small parts. This is an essential article, deserving the strictest attention of the farmer. Ground ploughed too wet, rises, as we say, *whole-fur*, as when pasture-ground is ploughed: where ploughed too dry, it rises in great lumps, which are not reduced by subsequent ploughings; not to mention, that it requires double force to plough ground too dry, and that the plough is often broken to pieces. When the ground is in proper order, the farmer can have no excuse for delaying a single minute. This first course of fallow must, it is true, yield to the barley-feed; but as the barley-feed is commonly over the first week of May, or sooner, the season must be unfavourable if the fallow cannot be reached by the middle of May.

As clay soil requires high ridges, these ought to be cleaved at the first ploughing, beginning at the furrow, and ending at the crown. This ploughing ought to be as deep as the soil will admit: and water-furrowing ought instantly to follow; for if rain happen before water-furrowing, it stagnates in the furrow, necessarily delays the second ploughing till that part of the ridge be dry, and prevents the furrow from being mellowed and roasted by the sun. If this first ploughing be well executed, annual weeds will rise in plenty.

About the first week of June, the great brake will loosen and reduce the soil, encourage a second crop of annuals, and raise to the surface the roots of weeds moved by the plough. Give the weeds time to spring, which may be in two or three weeks. Then proceed to the second ploughing about the beginning of July; which must be cross the ridges, in order to reach all the slips of the former ploughing. By cross-ploughing the furrows will be filled up, and water furrowing be still more necessary than before. Employ the brake again about the 10th of August, to destroy the annuals that

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As in ploughing a clay soil it is of importance to prevent poaching, the hinting furrows ought to be done with two horses in a line. If four ploughs be employed in the same field, to one of them may be allotted the care of finishing the hinting furrows.

123 Dressing loam for wheat. Loam, being a medium between sand and clay, is of all soils the fittest for culture, and the least subject to chances. It does not hold water like clay; and when wet, it dries sooner. At the same time, it is more retentive than sand of that degree of moisture which promotes vegetation. On the other hand, it is more subject to couch-grass than clay, and to other weeds; to destroy which, fallowing is still more necessary than in clay.

Beginning the fallow about the first of May, or as soon as barley-seed is over, take as deep a furrow as the soil will admit. Where the ridges are so low and narrow as that the crown and furrow can be changed alternately, there is little or no occasion for water furrowing. Where the ridges are so high as to make it proper to cleave them, water-furrowing is proper. The second ploughing may be at the distance of five weeks. Two crops of annuals may be got in the interim, the first by the brake and the next by the harrow; and by the same means eight crops may be got in the season. The ground must be cleared of couch-grass and knot-grass roots, by the cleaning harrow described above. The time for this operation is immediately before the manure is laid on. The ground at that time being in its loosest state, parts with its grass roots more freely than at any other time. After the manure is spread, and incorporated with the soil by breaking or harrowing, the seed may be sown under furrow, if the ground hang so as easily to carry off the moisture. To leave it rough without harrowing has two advantages: it is not apt to cake with moisture, and the inequalities make a sort of shelter to the young plants against frost. But if it lie flat, it ought to be smoothed with a slight harrow after the seed is sown, which will facilitate the course of the rain from the crown to the furrow.

124 Dressing a sandy soil. A sandy soil is too loose for wheat. The only chance for a crop is after red clover, the roots of which bind the soil; and the instructions above given for loam are applicable here. Rye is a crop much fitter for sandy soil than wheat; and, like wheat, is generally sown after a summer-fallow.

125 Time for sowing. Lastly, Sow wheat as soon in the mouth of October as the ground is ready. When sown a month more early, it is too forward in the spring, and apt to be hurt by frost; when sown a month later, it has not time to root before frost comes on, and frost spews it out of the ground.

Setting of wheat, a method which is reckoned one

of the greatest improvement in husbandry that has taken place this century. It seems to have been first suggested by planting grains in a garden from mere curiosity, by persons who had no thought or opportunity of extending it to a lucrative purpose. Nor was it attempted on a larger scale, till a little farmer near Norwich began it about 17 years since, upon less than 126
an acre of land. For two or three years only a few Setting of followed his example; and those were generally the wheat. butt of their neighbours merriment for adopting so singular a practice. They had, however, considerably better corn and larger crops than their neighbours: this, together with the saving in seed, engaged more to follow them: while some ingenious persons, observing its great advantage, recommended and published its utility in the Norwich papers. These recommendations had their effect. The curiosity and inquiry of the Norfolk farmers (particularly round Norwich) were excited, and they found sufficient reason to make general experiments. Among the rest was one of the largest occupiers of lands in this county, who set 57 acres in one year. His success, from the visible superiority of his crop, both in quantity and quality, was so great, that the following autumn he set 300 acres, and has continued the practice ever since. This noble experiment established the practice, 127 A capital
and was the means of introducing it generally among improvement in a-
the intelligent farmers in a very large district of land; griculture.
there being few who now sow any wheat, if they can procure hands to set it. It has been generally observed, that although the set crops appear very thin during the autumn and winter, the plants tiller and spread prodigiously in the spring. The ears are indisputably larger, without any dwarfish or small corn; the grain is of a larger bulk, and specifically heavier per bushel than when sown.

The lands on which this method is particularly prosperous, are either after clover stubble, or on which 128 Method.
trefoil and grass-seed were sown the spring before the last. These grounds, after the usual manuring, are once turned over by the plough in an extended flag or turf, at ten inches wide; along which a man, who is called a *dibbler*, with two setting-irons, somewhat bigger than ram-rods, but considerably bigger at the lower end, and pointed at the extremity, steps backwards along the turf and makes the holes about four inches asunder every way, and an inch deep. Into these holes the droppers (women, boys, and girls) drop two grains, which is quite sufficient. After this, a gate bushed with thorns is drawn by one horse over the land, and closes up the holes. By this mode, three pecks of grain is sufficient for an acre; and being immediately buried, it is equally removed from vermin or the power of frost. The regularity of its rising gives the best opportunity of keeping it clear from weeds, by weeding or hand-hoeing.

Wheat-setting is a method peculiarly beneficial when 129 Peculiar
corn is dear; and, if the season be favourable, may be advantages.
practised with great benefit to the farmer. Sir Thomas Beevor of Hathel-Hall in Norfolk, found the produce to be two bushels per acre more than from the wheat which is sown; but having much less small corn intermixed with it, the sample is better, and always fetches a higher price, to the amount generally of two shillings per quarter.

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This method, too, saves to the farmer and to the public six pecks of seed-wheat in every acre; which, if nationally adopted, would of itself afford bread for more than half a million of people.

Add to these considerations, the great support given to the poor by this *second* harvest, as it may be called, which enables them to discharge their rents and maintain their families without having recourse to the parish.—The expence of setting by hand is now reduced to about ten shillings per acre; which, in good weather, may be done by one dibbler, attended by three droppers, in two days. This is five shillings per day; of which, if the dibbler gives to the children sixpence each, he will have himself three shillings and sixpence for his day's work, which is much more than he can possibly earn by any other labour so easy to himself. But put the case, that the man has a wife who dibbles with him, and two or three of his own children to drop to him, you see his gains will then be prodigious, and enough to ensure a plenty of candidates for that work, even in the least populous parts of the country.

It is, however, to be observed with regard to this method, that in seasons when seed-corn is very cheap, or the autumn particularly unfavourable to the practice, it must certainly be lessened. In light lands, for instance, a very dry time prevents dibbling; as the holes made with the instruments will be filled up again by the mould as fast as the instrument is withdrawn. So, again, in a very wet season, on strong and stiff clays, the seeds in the holes cannot be well and properly covered by the bushes drawn over them. But these extremes of dry and wet do not often happen, nor do they affect lands of a moderately consistent texture, or both light and heavy soils at the same time, so that the general practice is in fact never greatly impeded by them.

130 Propagating of wheat by dividing the roots.

Propagating of wheat by dividing and transplanting its roots. In the Philosophical Transactions for 1768, we meet with a very extraordinary experiment, of which the following is an abstract. On the 2d of June 1766, Mr C. Miller sowed some grains of the common red wheat; and on the 8th of August a single plant was taken up and separated into 18 parts, and each part planted separately. These plants having pushed out several side-shoots, by about the middle of September some of them were then taken up and divided, and the rest of them between that time and the middle of October. This second division produced 67 plants. These plants remained through the winter, and another division of them, made between the middle of March and the 12th of April, produced 500 plants. They were then divided no further, but permitted to remain. The plants were in general stronger than any of the wheat in the fields. Some of them produced upwards of 100 ears from a single root. Many of the ears measured seven inches in length, and contained between 60 and 70 grains.

The whole number of ears which, by the process abovementioned, were produced from one grain of wheat, was 21,109, which yielded three pecks and three quarters of clear corn, the weight of which was 47 lb. 7 ounces; and from a calculation made by counting the number of grains in an ounce, the whole number of grains was about 576,840.

By this account we find, that there was only one general division of the plants made in the spring. Had a second been made, Mr Miller thinks the number of plants would have amounted to 2000 instead of 500, and the produce thereby much enlarged.

The ground was a light blackish soil, upon a gravelly bottom; and consequently, a bad soil for wheat. One half of the ground was well dunged, the other half had no manure. There was, however, not any difference discoverable in the vigour, or growth, or produce, of the plants.

It must be evident, that the expence and labour of setting in the above manner by the hand, will render it impracticable upon a large scale so as to be productive of any utility. A correspondent of the Bath Society, therefore (Robert Bogle, Esq. of Daldowin, near Glasgow), with a view to extend the practice, has proposed the use of the harrow and roller until some better implements be invented. 131 Method proposed by Mr Bogle. This method occurred to him from attending to the practice usual with farmers on certain occasions, of harrowing their fields after the grain is sprung up. Upon investigating the principles upon which these practices are founded, he found them confined merely to that of pulverising the earth, without any attention to Mr Miller's doctrine. They said, "that after very heavy rains, and then excessive dry weather, the surface of their lands were apt to be caked, the tender fibres of the young roots were thereby prevented from pushing, and of course the vegetation was greatly obstructed; in such instances, they found very great benefit from harrowing and rolling."

These principles he acknowledges to be well founded, so far as relates to pulverising; but contends, that the benefit arising from harrowing and rolling is not derived from pulverising entirely, but also from subdividing and enabling the plants to tiller (as it is termed). "The harrow (he observes) certainly breaks the incrustation on the surface, and the roller crumbles the clods; but it is also obvious, that the harrow removes a great many of the plants from their original stations; and that if the corn has begun to tiller at the time it is used, the roots will be, in many instances, subdivided, and then the application of my system of divisibility comes into play. The roller then serves to plant the roots which have been torn up by the harrow."

132 Objections.

But on this the Society observe, that the teeth of a harrow are too large to divide roots so small and tenacious as are those of grain; and whenever such roots (however tillered) stand in the line any tooth makes, they will, if small, be only turned on one side by the earth yielding to their lateral pressure, or, if large, the whole root will probably be drawn out of the ground. The principal uses, therefore, derived from harrowing and rolling these crops are, opening the soil between the plants, earthing them up, breaking the clods, and closing the earth about their roots.

In a subsequent letter, Mr Bogle, without contesting these points, further urges the scheme of propagating wheat by dividing and transplanting its roots. "I have conversed (says he) much with many practical farmers, who all admit that my plan has the appearance not only of being practical, but advantageous. I have also seen in the ninth number of Mr Young's Annals of Agriculture, the account of an experiment which strongly corroborates my theory. It was made by the Rev. Mr Pike of Edmonton. From this, and other experiments

experiments which have been made under my own eye, I foresee clearly, that the system is practicable, and will certainly be productive of great benefit, should it become general. Besides the saving of nine-tenths of seed in the land sown broad-cast, other very important advantages will attend the setting out of wheat from a seed-bed, such as an early crop; the certainty of good crops; rendering a summer fallow unnecessary; saving dung; and having your wheat perfectly free from weeds without either hand or horse-hoeing. Five hundred plants in April produced almost a bushel of grain. My gardener says, he can set one thousand plants in a day, which is confirmed by the opinion of two other gardeners. Mr Miller found no difference in the produce of what was planted on lands that had dung, and on what had none, except where the land was improper for wheat at all."

133 Practicability of the scheme asserted.

134 Bath Society's observations.

On this letter we have the following note by the society: "Mr Bogle will see, by the society's premium-book this year, that by having offered several premiums for experiments of the kind he so earnestly recommends, we wish to have his theory brought to the test of practice. Our reason for this, as well as for printing Mr B's letter, was rather to excite decisive trials by ingenious persons, than from any expectation of the practice ever becoming a general one. General, indeed, it never can be. A sufficient number of hands could not be found to do it. Unkindly seasons at the time of transplanting and dividing the roots would frequently endanger and injure, if not destroy the crops. But admitting the mode generally practicable, we very much doubt whether all the advantages he has enumerated would be derived from this mode of culture. Why should dividing and transplanting the roots of wheat cause the crop to be early, or afford a *certainty* of its being *a good one?* We cannot think that *less manure* is necessary in this method, than either in drilling or broad-cast; nor can we by any means admit, that such crops would "be perfectly free from weeds without either hand or horse-hoeing." We readily agree with Mr Bogle, that by this mode of culture on a general scale, an immense quantity of seed-corn would be annually saved to the nation; and in this, we believe, the advantage, were it practicable would principally consist."

135 Further observations of Mr Bogle.

Upon the same subject, and that of harrowing all kinds of corn, we are informed, Mr Bogle, afterwards communicated to the Society his thoughts more at large, together with authentic accounts which were made at his instance, and which were attended with very great success. These, however, were received too late for publication in the last (3d) volume of their papers. But the Society, conceiving his system may be attended with considerable advantages if brought into general practice, have given, at the end of the volume, a few of his leading principles. Mr Bogle states,

1. That he has known many instances of very great crops having been obtained by harrowing fields of corn after they were sprouted; and therefore recommends the practice very warmly.

2. That he has also received an authentic account of one instance where the same good effects were produced by ploughing the field.

3. On the system of transplanting, he states, that a very great proportion of the seed will be saved, as a farmer may have a nursery, or small patch of plants, from which his fields may be supplied; he calculates that one acre will yield plants sufficient for 100 acres.

4. That a very great increase of crops may be obtained by this method, probably a double crop, nay perhaps a triple quantity of what is reaped either by drilling, or by the broad-cast husbandry.

5. That a great part of the labour may be performed by infirm men and women, and also by children, who are at present supported by the parish charity; and that of course the poor's rates may be considerably reduced.

6. That the expence will not exceed from 20s. to 30s. per acre, if the work be performed by able-bodied men and women; but that it will be much lower, if that proportion of the work which may be done by employing young boys and girls should be allotted to them.

7. That in general he has found the distance of nine inches every way a very proper distance for setting out the plants at; but recommends them to be tried at other spaces, such as six, eight, or even 12 inches.

8. That he conceives an earlier crop may be obtained in this manner than can be obtained by any other mode of cultivation.

9. That a clean crop may also be procured in this way, because if the land be ploughed immediately before the plants are set out, the corn will spring much quicker from the plants than the weeds will do from their seeds, and the corn will thereby bear down the growth of the weeds.

10. That such lands as are overflowed in the winter and spring, and are of course unfit for sowing with wheat in the autumn, may be rendered fit for crops of wheat by planting them in the spring, or even in the summer.

11. That he has known instances of wheat being transplanted in September, October, November, February, March, April, and even as late as the middle of May, which have all answered very well.

12. That he has known an early kind of wheat sown as late as the middle of May, which has ripened in very good time; and from that circumstance he conceives, if the plants should be taken from that early kind, the season of transplanting might be prolonged at least till the first of July, perhaps even later.

13. That he has reason to think wheat, oats, and barley, are not annuals, but are perennials, provided they are eaten down by cattle and sheep, or are kept low by the scythe or sickle; and are prevented from spindling or coming to the ear.

14. That one very prevalent motive with him in prosecuting this plan, is, that he is of opinion it may enable government to devise means of supporting the vagrant poor, both old and young, who are now to be met with every where, both in towns and in the country, and who are at present a burden on the community: but if such employment could be struck out for them, a comfortable subsistence might be provided for them by means of their own labour and industry; and not only save the public and private charitable contributions, but may also render that class of people useful and profitable subjects; instead of their remaining in a useless, wretched, and perhaps a profligate and vicious course of life.

Lastly, Mr Bogle had hinted at a secondary object which he has in view, from this mode of cultivation, which he apprehends may in time, with a small degree of attention, prove extremely advantageous to agriculture.—It is, that in the first place, the real and intrinsic value of different kinds of grain may be more accurately ascertained by making a comparison of it with a few plants of each kind set out at the same time, than can be done when sown in drills or broad-cast; and when the most valuable kinds of wheat, oats, or barley, are discovered, he states, that in a very short time (not exceeding four or five years) a sufficient quantity of that valuable kind may be procured to supply the kingdom with seed from a single grain of each kind; for he calculates, that 47,000 grains of wheat may be produced by divisibility in two years and three months.

136 Observations of the Bath Society.

Upon these propositions the Society observes, "That although Mr Bogle appears to be too sanguine in his expectations of seeing his plan realized in *general practice*, it certainly merits the attention of Gentlemen Farmers. We wish them to make fair experiments, and report their success. Every grand improvement has been, and ever will be, progressive. They must necessarily originate with gentlemen; and thence the circle is extended by almost imperceptible degrees over provinces and countries. At all events, Mr Bogle is justly intitled to the thanks of the Society, and of the public, for the great attention he has paid to the subject."

2. Oats.

137 Effect of frost upon tilled land.

As winter-ploughing enters into the culture of oats, we must remind the reader of the effect of frost upon tilled land. Providence has neglected no region intended for the habitation of man. If in warm climates the soil be meliorated by the sun, it is no less meliorated by frost in cold climates. Frost acts upon water, by expanding it into a larger space. Frost has no effect upon dry earth; witness sand, upon which it makes no impression. But upon wet earth it acts most vigorously: it expands the moisture, which requiring more space puts every particle of the earth out of its place, and separates them from each other. In that view, frost may be considered as a plough superior to any that is made, or can be made, by the hand of man: its action reaches the minutest particles; and, by dividing and separating them, it renders the soil loose and friable. This operation is the most remarkable in tilled land, which gives free access to frost. With respect to clay-soil in particular, there is no rule in husbandry more essential than to open it before winter in hopes of frost. It is even advisable in a clay-soil to leave the stubble rank; which, when ploughed in before winter, keeps the clay loose, and admits the frost into every cranny.

To apply this doctrine, it is dangerous to plough clay-soil when wet; because water is a cement for clay, and binds it so as to render it unfit for vegetation. It is, however, less dangerous to plough wet clay before winter than after. A succeeding frost corrects the bad effects of such ploughing; a succeeding drought increases them.

138 Culture of oats.

The common method is, to sow oats on new-ploughed land in the month of March, as soon as the ground is tolerably dry. If it continues wet all the month of March, it is too late to venture them after. It is much better to summer-fallow and to sow wheat in the autumn. But the preferable method, especially in clay-soil, is to turn over the field after harvest, and to lay it open to the influences of frost and air, which lessen the tenacity of clay, and reduce it to a free mould. The surface-soil by this means is finely mellowed for reception of the seed; and it would be a pity to bury it by a second ploughing before sowing. In general, the bulk of clay-soils are rich; and skilful ploughing without dung, will probably give a better crop, than unskilful ploughing with dung.

Hitherto of natural clays. We must add a word of carse-clays which are artificial, whether left by the sea, or sweeped down from higher grounds by rain. The method commonly used of dressing carse-clay for oats, is, not to stir it till the ground be dry in the spring, which seldom happens before the first of March, and the seed is sown as soon after as the ground is sufficiently dry for its reception. Frost has a stronger effect on such clays than on natural clay. And if the field be laid open before winter, it is rendered so loose by frost as to be soon drenched in water. The particles at the same time are so small as that the first drought in spring makes the surface cake or crust. The difficulty of reducing this crust into mould for covering the oat-seed, has led farmers to delay ploughing till the month of March. But we are taught by experience, that this soil ploughed before winter, is sooner dry than when the ploughing is delayed till spring; and as early sowing is a great advantage, the objection of the superficial crusting is easily removed by the first harrow above described, which will produce abundance of mould for covering the seed. The ploughing before winter not only produces early sowing, but has another advantage: the surface-soil that had been mellowed during winter by the sun, frost, and wind, is kept above.

The dressing a loamy soil for oats differs little from dressing a clay soil, except in the following particular, that being less hurt by rain, it requires not high ridges, and therefore ought to be ploughed crown and furrow alternately.

Where there is both clay and loam in a farm, it is obvious from what is said above, that the ploughing of the clay after harvest ought first to be dispatched. If both cannot be overtaken that season, the loam may be delayed till the spring with less hurt.

Next of a gravelly soil; which is the reverse of clay, as it never suffers but from want of moisture. Such a soil ought to have no ridges; but be ploughed circularly from the centre to the circumference, or from the circumference to the centre. It ought to be tilled after harvest: and the first dry weather in spring ought to be laid hold of to sow, harrow, and roll; which will preserve it in sap.

The culture of oats is the simplest of all. That grain is probably a native of Britain: it will grow on the worst soil with very little preparation. For that reason, before turnip was introduced, it was always the first crop upon land broken up from the state of nature.

Upon such land, may it not be a good method, to build upon the crown of every ridge, in the form of a wall, all the surface-earth, one sod above another, as in a fold for sheep? After standing in this form all the summer and winter, let the walls be thrown down, and the ground prepared for oats. This will secure

ſecure one or two good crops; after which the land may be dunged for a crop of barley and graſs-ſeeds. This method may anſwer in a farm where manure is ſcanty.

3. Barley.

139 Culture of barley.

This is a culmiferous plant that requires a mellow ſoil. Upon that account, extraordinary care is requiſite, where it is to be ſown in clay. The land ought to be ſtirred immediately after the foregoing crop is removed, which lays it open to be mellowed with the froſt and air.

140 Ribbing.

In that view, a peculiar ſort of ploughing has been introduced, termed *ribbing*; by which the greateſt quantity of ſurface poſſible is expoſed to the air and froſt. The obvious objection to this method is, that half of the ridge is left unmoved. And to obviate that objection, the following method is offered, which moves the whole ſoil, and at the ſame time expoſes the ſame quantity of ſurface to the froſt and air.

141 A better method.

As ſoon as the former crop is off the field, let the ridges be gathered with as deep a furrow as the ſoil will admit, beginning at the crown and ending at the furrows. This ploughing looſens the whole ſoil, giving free acceſs to the air and froſt. Soon after begin a ſecond ploughing in the following manner. Let the field be divided by parallel lines acroſs the ridges, with intervals of 30 feet or ſo. Plough once round an interval, beginning at the edges, and turning the earth toward the middle of the interval; which covers a foot or ſo of the ground formerly ploughed. Within that foot plough another round ſimilar to the former; and after that, other rounds, till the whole interval be finiſhed, ending at the middle. Inſtead of beginning at the edges, and ploughing toward the middle, it will have the ſame effect to begin at the middle and to plough toward the edges. Plough the other intervals in the ſame manner. As by this operation the furrows of the ridges will be pretty much filled up, let them be cleared and water-furrowed without delay. By this method, the field will be left waving like a plot in a kitchen-garden, ridged up for winter. In this form, the field is kept perfectly dry; for beſide the capital furrows that ſeparate the ridges, every ridge has a number of croſs furrows that carry the rain inſtantly to the capital furrows. In hanging grounds retentive of moiſture, the parallel lines abovementioned ought not to be perpendicular to the furrows of the ridges, but to be directed a little downward, in order to carry rain-water the more haſtily to theſe furrows. If the ground be clean, it may lie in that ſtate winter and ſpring, till the time of ſeed-furrowing. If weeds happen to riſe, they muſt be deſtroyed by ploughing, or breaking, or both; for there cannot be worſe huſbandry, than to put ſeed into dirty ground.

142 Advantages of this method.

This method reſembles common ribbing in appearance, but is very different in reality. As the common ribbing is not preceded by a gathering furrow, the half of the field is left untilled, compact as when the former crop was removed, impervious in a great meaſure to air or froſt. The common ribbing at the ſame time lodges the rain-water on every ridge, preventing it from deſcending to the furrows; which is hurtful in all ſoils, and poiſonous in a clay ſoil. The *ſtitching* here deſcribed, or *ribbing*, if you pleaſe to call it ſo, prevents theſe noxious effects. By the two ploughings the whole ſoil is opened, admitting freely air and froſt; and the multitude of furrows lays the ſurface perfectly dry, giving an early opportunity for the barley-ſeed.—But further, as to the advantage of this method: When it is proper to ſow the ſeed, all is laid flat with the brake, which is an eaſy operation upon the ſoil that is dry and pulverized; and the ſeed-furrow which ſucceeds, is ſo ſhallow as to bury little or none of the ſurface-earth: whereas the ſtirring for barley is commonly done with the deepeſt furrow; and conſequently buries all the ſurface-ſoil that was mellowed by the froſt and air.

143 Management of ſeed in a dry ſeaſon.

Nor is this method more expenſive; becauſe the common ribbing muſt always be followed with a ſtirring furrow, which is ſaved in the method recommended. Nay, it is leſs expenſive; for after common ribbing, which keeps in the rain water, the ground is commonly ſo ſoured, as to make the ſtirring a laborious work.

It is well known that barley is leſs valuable when it does not ripen equally; and that barley which comes up ſpeedily in a duſky ſoil, muſt gain a great advantage over ſeed-weeds. Therefore, firſt take out about one-third of the contents of the ſacks of ſeed barley or bear, to allow for the ſwelling of the grain. Lay the ſacks with the grain to ſteep in clean water; let it lie covered with it for at leaſt 24 hours. When the ground is ſo dry as at preſent, and no likelihood of rain for 10 days, it is better to lie 36 hours. Sow the grain wet from ſteeping, without any addition of powdered quick-lime, which, though often recommended in print, can only poiſon the ſeed, ſuck up part of its uſeful moiſture, and burn the hands of the ſower. The ſeed will ſcatter well, as clean water has no tenacity; only the ſower muſt put in a fourth or a third more ſeed in bulk than uſual of dry grain, as the grain is ſwelled in that proportion: harrow it in as quickly as poſſible after it is ſown; and though not neceſſary, give it the benefit of freſh furrow, if convenient. You may expect it up in a fortnight at fartheſt.

The following experiment by a correſpondent of the Bath ſociety being conſidered as a very intereſting one, is here ſubjoined.

144 Important experiments on ſeed-barley

"The laſt ſpring (1783) being remarkably dry, I ſoaked my ſeed-barley in the black water taken from a reſervoir which conſtantly receives the draining of my dung-heap and ſtables. As the light corn floated on the top, I ſkimmed it off, and let the reſt ſtand 24 hours. On taking it from the water, I mixed the ſeed grain with a ſufficient quantity of ſifted wood-aſhes, to make it ſpread regularly, and ſowed three fields with it. I began ſowing the 16th, and finiſhed the 23d of April. The produce was 60 buſhels per acre, of good clean barley, without any *ſmall* or *green* corn, or weeds at harveſt. No perſon in this country had better grain.

I ſowed alſo ſeveral other fields with the ſame ſeed dry, and without any preparation; but the crop, like thoſe of my neighbours, was very poor; not more than twenty buſhels per acre, and much mixed with *green* corn and weeds when harveſted. I alſo ſowed ſome of the ſeed dry on one ridge in each of my former fields, but the produce was very poor in compariſon of the other parts of the field."

Where the land is in good order, and free of weeds, April

Practice.

145 Time of sowing. April is the month for sowing barley. Every day is proper, from the first to the last.

The dressing loamy soil and light soil for barley, is the same with that described; only that to plough dry is not altogether so essential as in dressing clay-soil. Loam or sand may be stirred a little moist: better, however, delay a week or two, than to stir a loam when moist. Clay must never be ploughed moist, even tho' the season should escape altogether. But this will seldom be necessary; for not in one year out of 20 will it happen, but that clay is dry enough for ploughing some time in May. Frost may correct clay ploughed wet after harvest; but ploughed wet in the spring, it unites into a hard mass, not to be dissolved but by very hard labour.

On the cultivation of this grain we have the following observations by a Norfolk farmer.

146 Miscellaneous observations concerning the cultivation of barley. The best soil, he observes, is that which is dry and healthy, rather light than stiff, but yet of sufficient tenacity and strength to retain the moisture. On this kind of land the grain is always the best bodied and coloured, the nimblest in the land, and has the thinnest rind. These are qualities which recommend it most to the maltster. If the land is poor, it should be dry and warm; and when so, it will often bear better corn than richer land in a cold and wet situation.

In the choice of your seed, it is needful to observe, that the best is of a pale lively colour, and brightish cast, without any deep redness, or black tinge at the tail. If the rind be a little shrivelled, it is the better; for that slight shrivelling proves it to have a thin skin, and to have sweated in the mow. The necessity of a change of seed by not sowing two years together what grew on the same soil, is not in any part of husbandry more evident than in the culture of this grain, which, if not frequently changed, will grow coarser and coarser every succeeding year.

It has generally been thought that seed-barley would be benefited by steeping; but liming it has, in many instances, been found prejudicial. Sprinkling a little soot with the water in which it is steeped has been of great service, as it will secure the seed from insects. In a very dry seed-time, barley that has been wetted for malting, and begins to sprout, will come up sooner, and produce as good a crop as any other.

If you sow after a fallow, plough three times at least. At the first ploughing, lay your land up in small ridges, and let it remain so during the winter, for the frost to mellow it; the second ploughing should be at the beginning of February. In March split the ridges, and lay the land as flat as possible, at the same time harrowing it fine. But in strong wet lands (if you have no other for barley) lay it round, and make deep furrows to receive the water.

"I have often (continues he), taken the following method with success: On lands tolerably manured, I sowed clover with my barley, which I reaped at harvest; and fed the clover all the following winter, and from spring to July, when I fallowed it till the following spring, and then sowed it with barley and clover as before. Repeating this method every year I had very large crops, but would not recommend this practice on poor light land.

"We sow on our lightest lands in April, on our moist lands in May; finding that those lands which are the most subject to weeds produce the best crops when sown late.

Practice.

"The common method is to sow the barley-seed broad-cast at two sowings; the first harrowed in once. the second twice; the usual allowance from three to four bushels per acre. But if farmers could be prevailed on to alter this practice, they would soon find their account in it. Were only half the quantity sown equally, the produce would be greater, and the corn less liable to lodge: For when corn stands very close, the stalks are grown up weak; and on that account are less capable of resisting the force of winds, or supporting themselves under heavy rains.

"From our great success in setting and drilling wheat, some of our farmers tried these methods with barley; but did not find it answer their expectations, except on very rich land.

"I have myself had 80 stalks on one root of barley, which all produced good and long ears, and the grain was better than any other; but the method is too expensive for general practice. In poor land, sow thin, or your crop will be worth little. Farmers who do not reason on the matter, will be of a different opinion; but the fact is indisputable."

When the barley is sowed and harrowed in, he advises that the land be rolled after the first shower of rain to break the clods. This will close the earth about the roots, which will be a great advantage to it in dry weather.

When the barley has been up three weeks or a month, it is a very good way to roll it again with a heavy roller, which will prevent the sun and air from penetrating the ground to the injury of the roots. This rolling, before it branches out, will also cause it to tiller into a great number of stalks; so that if the plants be thin, the ground will be thereby filled, and the stalks strengthened.

If the blade grows too rank, as it sometimes will in a warm wet spring, mowing is a much better method than feeding it down with sheep; because the scythe takes off only the rank tops, but the sheep being fond of the sweet end of the stalk next the root, will often bite so close as to injure the future growth.

4. Buck-wheat.

The uses of this plant have been mentioned in the preceding part, n° 46. It delights in a mellow sandy soil; but succeeds well in any dry loose healthy land, and moderately so in a free loamy stone brash. A stiff clay is its aversion, and it is entirely labour lost to sow it in a wet poachy ground. The proper season for sowing is from the last week of May or the beginning of June. It has been sown, however, so early as the beginning of April, and so late as the 22d of July, by way of experiment; but the latter was rather extreme to be chosen, and the former was in danger from frost. In an experiment upon a small piece of ground, the grain of two different crops was brought to maturity in the summer 1787.—After spring feedings, a crop of turnip-rooted cabbage, or vetches, there will be sufficient time to sow the land with buck-wheat. Probably, in hot dry summers, a crop of vetches might even be mown for hay early enough to introduce a crop of this grain after it. 147 Culture of Buck-wheat.

In the year 1780, about seven acres of a sandy soil on

Practice.

on Brislington Common (A), having been first tolerably well cleansed from brambles, furze, &c. received one ploughing. To reduce the irregularities of the surface, it was rolled; and on the 9th of June in that year, two bushels and a half of buck-wheat per acre sown, the ground rolled again without harrowing.

148 Advantages of this cropping.

The vegetation appeared in five or six days, as is constantly the case be the weather wet or dry. The growth was so rapid, that the fern, with which this land greatly abounded, was completely kept under. About the middle of September the crop was mown, but by reason of a great deal of rain about that time, it was not secured until the beginning of October; hence a loss of great part of the grain by shedding, as well as some eaten by birds. However, there were saved about 24 Winchester bushels per acre; and, notwithstanding its long exposure to the weather, received no sort of damage, only perhaps that the finest and most perfect grain was the first to fall from the plant. The ground after this had almost the appearance of a fallow, and was immediately ploughed.

When it had lain a moderate time to meliorate, and to receive the influences of the atmosphere, it was harrowed, sown with Lammas wheat, and ploughed in under furrow, in a contrary direction to the first ploughing. Thus a piece of land, which in the month of April was altogether in a state of nature, in the following November was seen under a promising crop of what is well styled the king of grain, and this without the aid of manure, or of any very great degree of tillage. Nor was the harvest by any means deficient; for several persons conversant in such things estimated the produce from 26 to 30 bushels per acre. As soon as the wheat crop was taken off, the ground had one ploughing, and on the first of September following was sown with turnip-seed. The turnips were not large, but of an herbage so abundant as in the following spring to support 120 ewes with their lambs, which were fed on it by folding four weeks. After this it was manured with a composition of rotten dung and natural earth, about 20 putt loads per acre, and planted with potatoes. The crop sold for L. 138, besides a considerable number used in the family, and a quantity reserved with which ten acres were planted the following season. The ensuing autumn it was again sown with wheat, and produced an excellent crop. In the spring of 1784, it was manured and planted with potatoes, as in the preceding instance; the crop (tho' tolerably good) by no means equal to the former, producing about 100 sacks per acre only. In spring 1785, the land was now for a third time under a crop of wheat, it being intended to try how far this mode of alternate cropping, one year with potatoes and another with wheat, may be carried.

From the success of the preceding and other experiments, by Nehemiah Bartley Esq; of Bristol, as detailed in the Bath Society Papers, it would seem, that the culture of this plant ought in many cases to be adopted instead of a summer-fallowing: for the crop produced appears not only to be so much clear gain in respect to such practice, but also affords a considerable quantity of straw for fodder and manure; beside that a summer fallowing is far from being so advantgeous a preparation for a succeeding crop.

5. Beans.

149 Culture of beans.

The properest soil for beans is a deep and moist clay. There was lately introduced into Scotland a method of sowing beans with a drill-plough, and horse-hoeing the intervals; which, beside affording a good crop, is a dressing to the ground. But as that method is far from being general, we keep in the common track.

As this grain is early sown, the ground intended for it should be ploughed before winter, to give access to the frost and air; beneficial in all soils, and necessary in a clay soil. Take the first opportunity after January when the ground is dry, to loosen the soil with the harrow first described, till a mould be brought upon it. Sow the seed, and cover it with the second harrow. The third will smooth the surface, and cover the seed equally. These harrows make the very best figure in sowing beans; which ought to be laid deep in the ground, not less than six inches. In clay soil, the common harrows are altogether insufficient. The soil, which has rested long after ploughing, is rendered compact and solid: the common harrows skim the surface: the seed is not covered: and the first hearty shower of rain lays it above ground. Where the farmer overtakes not the ploughing after harvest, and is reduced to plough immediately before sowing, the plough answers the purpose of the first harrow; and the other two will complete the work. But the labour of the first harrow is ill saved; as the ploughing before winter is a fine preparation, not only for beans, but for grain of every kind. If the ground ploughed before winter happen by superfluity of moisture to cake, the first harrow going along the ridges, and crossing them, will loosen the surface, and give access to the air for drying. As soon as the ground is dry, sow without delaying a moment. If rain happen in the interim, there is no remedy but patience till a dry day or two come.

Carse-clay, ploughed before winter, seldom fails to cake. Upon that account, a second ploughing is necessary before sowing; which ought to be performed with an ebb furrow, in order to keep the frost-mould as near the surface as possible. To cover the seed with the plough is expressed by the phrase *to sow under furrow*. The clods raised in this ploughing are a sort of shelter to the young plants in the chilly spring-months.

The foregoing method will answer for loam. And as for a sandy or gravelly soil, it is altogether improper for beans.

Though we cannot approve the horse-hoeing of beans, with the intervals that are commonly allotted for turnip, yet we would strongly recommend the drilling them at the distance of ten or 12 inches, and keeping the intervals clean of weeds. This may be done by hand-hoeing, taking opportunity at the same time to lay fresh soil to the roots of the plants. But as this is an expensive operation, and hands are not always to be got, a narrow plough, drawn by a single horse, might be used, with a mould-board on each side to scatter the earth

(A) A very rough piece of land, at that time just inclosed.

Practice. earth upon the roots of the plants. This is a cheap and expeditious method; it keeps the ground clean; and nourishes the plants with fresh soil.

As beans delight in a moist soil, and have no end of growing in a moist season, they cover the ground totally when sown broad cast, keep in the dew, and exclude the sun and air: the plants grow to a great height; but carry little seed, and that little not well ripened. This displays the advantage of drilling; which gives free access to the sun and air, dries the ground, and affords plenty of ripe seed.

6. Pease.

150 Culture of pease.

Pease are of two kinds; the white and the gray. The cultivation of the latter only belongs to this place.

There are two species of the grey kind, distinguished by their time of ripening. One ripens soon, and for that reason is termed *hot seed*: the other, which is slower in ripening, is termed *cold seed*.

Pease, a leguminous crop, is proper to intervene between two culmiferous crops; less for the profit of a pease-crop, than for meliorating the ground. Pease, however, in a dry season, will produce six or seven bolls each acre; but, in an ordinary season, they seldom reach above two, or two and a half. Hence, in a moist climate, red clover seems a more beneficial crop than pease; as it makes as good winter-food as pease, and can be cut green thrice during summer.

A field intended for cold seed ought to be ploughed in October or November; and in February, as soon as the ground is dry, the seed ought to be sown on the winter-furrow. A field intended for hot seed ought to be ploughed in March or April, immediately before sowing. But if infested with weeds, it ought to be also ploughed in October or November.

Pease laid a foot below the surface will vegetate; but the most approved depth is six inches in light soil, and four inches in clay soil; for which reason, they ought to be sown under furrow when ploughing is delayed till spring. Of all grain, beans excepted, they are the least in danger of being buried.

Pease differ from beans, in loving a dry soil and a dry season. Horse-hoeing would be a great benefit, could it be performed to any advantage; but pease grow expeditiously, and soon fall over and cover the ground, which bars ploughing. Horse-hoeing has little effect when the plants are new sprung; and when they are advanced to be benefited by that culture, their length prevents it. Fast growing at the same time is the cause of their carrying so little seed: the seed is buried among the leaves; and the sun cannot penetrate to make it grow and ripen. The only practicable remedy to obtain grain, is thin sowing; but thick sowing produces more straw, and mellows the ground more. Half a boll for an English acre may be reckoned thin sowing; three firlots, thick sowing.

Notwithstanding what is said above, Mr Hunter, a noted farmer in Berwickshire, began some time ago to sow all his pease in drills; and never failed to have great crops of corn as well as of straw. He sowed double rows at a foot interval, and two feet and an half between the double rows, which admit horse-hoeing. By that method, he had also good crops of beans on light land.

Pease and beans mixed are often sown together, in order to catch different seasons. In a moist season, the beans make a good crop; in a dry season, the pease. Practice.

The growth of plants is commonly checked by drought in the month of July; but promoted by rain in August. In July, grass is parched; in August, it recovers verdure. Where pease are so far advanced in the dry season as that the seed begins to form, their growth is indeed checked, but the seed continues to fill. If only in the blossom at that season, their growth is checked a little; but they become vigorous again in August, and continue growing without filling till stopped by frost. Hence it is, that cold seed, which is early sown, has the best chance to produce corn: hot seed, which is late sown, has the best chance to produce straw.

The following method is practised in Norfolk, for sowing pease upon a dry light soil, immediately opened from pasture. The ground is pared with a plough extremely thin, and every sod is laid exactly on its back. In every sod a double row of holes is made. A pea dropt in every hole lodges in the flay'd ground immediately below the sod, thrusts its roots horizontally, and has sufficient moisture. This method enabled Norfolk farmers, in the barren year 1740, to furnish white pease at 12s. per boll.

II. Plants cultivated for Roots. [*See also Art. III.*]

1. Turnip.

Turnip delights in a gravelly soil; and there it can be raised to the greatest perfection, and with the least hazard of miscarrying. At the same time, there is no soil but will bear turnip when well prepared. 151 Culture of turnip.

No person ever deserved better of a country, than he who first cultivated turnip in the field. No plant is better fitted for the climate of Britain, no plant prospers better in the coldest part of it, and no plant contributes more to fertility. In a word, there has not for two centuries been introduced into Britain a more valuable improvement.

Of all roots, turnip requires the finest mould; and to that end, of all harrows frost is the best. In order to give access to frost, the land ought to be prepared by ribbing after harvest, as above directed in preparing land for barley. If the field be not subject to annuals, it may lie in that state till the end of May; otherwise the weeds must be destroyed by a breaking about the middle of April; and again in May, if weeds rise. The first week of June, plough the field with a shallow furrow. Lime it if requisite, and harrow the lime into the soil. Draw single furrows with intervals of three feet, and lay dung in the furrows. Cover the dung sufficiently, by going round it with the plough, and forming the three-feet spaces into ridges. The dung comes thus to lie below the crown of every ridge.

The season of sowing must be regulated by the time intended for feeding. Where intended for feeding in November, December, January, and February, the seed ought to be sown from the 1st to the 20th of June. Where the feeding is intended to be carried on to March, April, and May, the seed must not be sown till the end of July. Turnip sown earlier than above directed, flowers that very summer, and runs fast to seed; which renders it in a good measure unfit for food. 152 Season and method of sowing.

Practice.

food. If sown much later, it does not apple, and there is no food but from the leaves.

Though by a drill-plough the seed may be sown of any thickness, the safest way is to sow thick. Thin sowing is liable to many accidents, which are far from being counterbalanced by the expence that is saved in thinning. Thick-sowing can bear the ravage of the black fly, and leave a sufficient crop behind. It is a protection against drought, gives the plants a rapid progress, and establishes them in the ground before it is necessary to thin them.

The sowing turnip broadcast is universal in England, and common in Scotland, though a barbarous practice. The eminent advantage of turnip is, that beside a profitable crop, it makes a most complete fallow; and the latter cannot be obtained but by horse-hoeing. Upon that account, the sowing turnip in rows at three feet distance is recommended. Wider rows answer no profitable end, straiter rows afford not room for a horse to walk in. When the turnip is about four inches high, annual weeds will appear. Go round every interval with the slightest furrow possible, at the distance of two inches from each row, moving the earth from the rows toward the middle of the interval. A thin plate of iron must be fixed on the left side of the plough, to prevent the earth from falling back and burying the turnip. Next, let women be employed to weed the rows with their fingers; which is better, and cheaper done, than with the hand-hoe. The hand-hoe, beside, is apt to disturb the roots of the turnip that are to stand, and to leave them open to drought by removing the earth from them. The standing turnip are to be at the distance of twelve inches from each other: a greater distance makes them swell too much; a less distance affords them not sufficient room. A woman soon comes to be expert in finger-weeding. The following hint may be necessary to a learner. To secure the turnip that is to stand, let her cover it with the left hand; and with the right pull up the turnip on both sides. After thus freeing the standing turnip, she may safely use both hands. Let the field remain in this state till the appearance of new annuals make a second ploughing necessary; which must be in the same furrow with the former, but a little deeper. As in this ploughing the iron plate is to be removed, part of the loose earth will fall back on the roots of the plants: the rest will fill the middle of the interval, and bury every weed. When weeds begin again to appear, then is the time for a third ploughing in an opposite direction, which lays the earth to the roots of the plants. This ploughing may be about the middle of August; after which, weeds rise very faintly. If they do rise, another ploughing will clear the ground of them. Weeds that at this time rise in the row, may be cleared with a hand-hoe, which can do little mischief among plants distant twelve inches from each other. It is certain, however, that it may be done cheaper with the hand (A). And after the leaves of turnips in a row meet together, the hand is the only instrument that can be applied for weeding.

In swampy ground, the surface of which is best reduced by paring and burning, the seed may be sown in rows with intervals of a foot. To save time, a drill-plough may be used that sows three or four rows at once. Hand-hoeing is proper for such ground; because the soil under the burnt *stratum* is commonly full of roots, which digest and rot better under ground than when brought to the surface by the plough. In the mean time, while these are digesting, the ashes will secure a good crop.

153 Properties of different sorts of turnip.

In cultivating turnips to advantage, great care should be taken to procure good, bright, nimble, and well-dried seed, and of the best kinds.

The Norfolk farmers generally raise the oval white, the large green-topp'd, and the red or purple-topp'd kinds, which from long experience they have found to be the most profitable.

The roots of the green-topp'd will grow to a large size, and continue good much longer than others. The red or purple-topp'd will also grow large, and continue good to the beginning of February; but the roots become hard and stringy sooner than the former.

The green-topp'd growing more above ground, is in more danger of sustaining injury from severe frosts than the red or purple, which are more than half covered by the soil; but it is the softest and sweetest, when grown large, of any kind. We have seen them brought to table a foot in diameter, and equally good as garden turnips.

Turnips delight in a light soil, consisting of sand and loam mixed; for when the soil is rich and heavy, although the crop may be as great in weight, they will be rank, and run to flower earlier in spring.

154 Observations with regard to seed.

Turnip-seed, like that of grain, will not do well without frequent changing. The Norfolk seed is sent to most parts of the kingdom, and even to Ireland, but after two years it degenerates; so that those who wish to have turnips in perfection should procure it fresh every year from Norwich, and they will find their account in so doing. For from its known reputation, many of the London seedmen sell, under that character, seed raised in the vicinity of the metropolis, which is much inferior in quality.

When the plants have got five leaves, they should be hoed, and set out at least six inches apart. A month afterward, or earlier if it be a wet season, a second hoeing should take place, and the plants be left at least 14 inches distant from each other, especially if intended for feeding cattle; for where the plants are left thicker, they will be proportionably smaller, unless the land is very rich indeed.

155 Methods of culture in Norfolk.

Some of the best Norfolk farmers sow turnips in drills three feet asunder, and at a second hoeing leave them a foot apart in the rows. By this means the trouble and expence of hoeing is much lessened, and the crop of equal weight as when sown in the common

(A) Children under thirteen may be employed to weed turnip with the fingers. We have seen them go on in that work with alacrity; and a small premium will have a good effect. For boys and girls above thirteen, a hand-hoe adapted to their size is an excellent instrument: it strengthens the arms amazingly. In driving the plough, the legs only are exercised; but as the arms are chiefly employed in husbandry, they ought to be prepared beforehand by gentle exercise.

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mon method. The intervals may easily be cleared of weeds by the horse-hoe.

Great quantities of turnips are raised in Norfolk every year for feeding black cattle, which turn to great advantage.

156 Value as food for cattle.

It is well known, that an acre of land contains 4840 square yards, or 43,560 square feet; suppose then that every square foot contains one turnip, and that they weigh only two pounds each on an average, here will be a mass of food excellent in kind, of 46 tons per acre, often worth from four to five guineas, and sometimes more.

Extraordinary corps of barley frequently succeed turnips, especially when fed off the land. In feeding them off, the cattle should not be suffered to run over too much of the ground at once, for in that case they will tread down and spoil twice as many as they eat. In Norfolk, they are confined by hurdles to as much as is sufficient for them for one day. By this mode the crop is eaten clean, the soil equally trodden, which if light, is of much service, and equally manured by the cattle.

A notion prevails in many places, that mutton fattened with turnips is thereby rendered rank and ill-tasted; but this is a vulgar error. The best mutton in Norfolk (and few counties have better) is all fed with turnips. It is rank pastures, and marshy lands, that produce rank mutton.

If the land be wet and springy, the best method is to draw and carry off your turnips to some dry pastures; for the treading of the cattle will not only injure the crop, but render the land so stiff, that you must be at an additional expence in ploughing.

157 Method of preserving turnips.

To preserve turnips for late spring feed, the best method, and which has been tried with success by some of the best English farmers, is, To stack them up in dry straw; a load of which is sufficient to preserve 40 tons of turnips. The method is easy, and as follows:—

After drawing your turnips in February, cut off the tops and tap roots, (which may be given to sheep), and let them lay a few days in the field, as no weather will then hurt them.

Then, on a layer of straw next the ground, place a layer of turnips two feet thick; and then another layer of straw, and so on alternately, till you have brought the heap to a point. Care must be taken to turn up the edges of the layers of straw, to prevent the turnips from rolling out; cover the top well with long straw, and it will serve as a thatch for the whole.

In this method, as the straw imbibes the moisture exhaled from the roots, all vegetation will be prevented, and the turnips will be nearly as good in May as when first drawn from the field. If straw be scarce, old haulm or stubble will answer the same purpose.

But to prevent this trouble and expence, perhaps farmers in all countries would find it most to their interest to adopt the method used by the Norfolk farmers, which is, to continue sowing turnips to the latter end of August; by which means their late crops remain good in the field till the latter end of April, and often till the middle of May.

The advantages of having turnips good till the spring feed is generally ready, are so obvious and so great, that many of the most intelligent farmers (although at first prejudiced against the practice) are now come into it, and find their account in so doing.

2. Potatoes.

158 General culture.

The choice of soil is not of greater importance in any other plant than in a potatoe. This plant in clay soil, or in rank black loam lying low without ventilation, never makes palatable food. In a gravelly or sandy soil, exposed to the sun and to free air, it thrives to perfection, and has a good relish. But a rank black loam, though improper to raise potatoes for the table, produces them in great plenty; and the product is, as already observed, a palatable food for horned cattle, hogs, and poultry.

The spade is a proper instrument for raising a small quantity, or for preparing corners or other places inaccessible to the plough; but for raising potatoes in quantities, the plough is the only instrument.

As two great advantages of a drilled crop are, to destroy weeds, and to have a fallow at the same time with the crop, no judicious farmer will think of raising potatoes in any other way. In September or October, as soon as that year's crop is removed, let the field have a rousing furrow, a cross-breaking next, and then be cleared of weeds by the cleaning harrow. Form it into three-feet ridges, in that state to lie till April, which is the proper time for planting potatoes. Cross-brake it, to raise the furrows a little. Then lay well-digested horse-dung along the furrows, upon which lay the roots at eight inches distance. Cover up the roots with the plough, going once round every row. This makes a warm bed for the potatoes; hot dung below, and a loose covering above, that admits every ray of the sun. As soon as the plants appear above ground, go round every row a second time with the plough, which will lay upon the plants an additional inch or two of mould, and at the same time bury all the annuals; and this will complete the ploughing of the ridges. When the potatoes are six inches high, the plough, with the deepest furrow must go twice along the middle of each interval in opposite directions, laying earth first to one row, and next to the other. And to perform this work, a plough with a double mould-board will be more expeditious. But as the earth cannot be laid close to the roots by the plough, the spade must succeed, with which four inches of the plants must be covered, leaving little more but the tops above ground; and this operation will at the same time bury all the weeds that have sprung since the former ploughing. What weeds arise after must be pulled up with the hand. A hoe is never to be used here: it cannot go so deep as to destroy the weeds without cutting the fibres of the plants; and if it skim the surface, it only cuts off the heads of the weeds, and does not prevent their pushing again.

159 particular methods.

In the Bath Society Papers, we have the following practical observations on the culture and use of potatoes, given as the result of various experiments made for five years successively on that valuable root, the growth of which cannot be too much encouraged.

When the potatoe crop has been the only object in view, the following method is the most eligible.

The land being well pulverized by two or three good harrowings and ploughings, is then manured with 15 or 20 cart-loads of dung per acre, before it receives its last

last earth. Then it is thrown on to what the Suffolk farmers call the *Trench balk*, which is narrow and deep ridge-work, about 15 inches from the centre of one ridge to the centre of the other. Women and children drop the sets in the bottom of every furrow 15 inches apart; men follow, and cover them with large hoes, a foot in width, pulling the mould down so as to bury the sets five inches deep; they must receive two or three hand-hoeings, and be kept free from weeds; always observing to draw the earth as much as possible to the stems of the young plants. By repeated trials, the first or second week in April is found the most advantageous time for planting.

In the end of September or the beginning of October, when the haulm becomes withered, they should be ploughed up with a strong double breasted-plough. The workman must be cautioned to set his plough very deep, that he may strike below all the potatoes, to avoid damaging the crop. The women who pick them up, if not carefully attended to, will leave many in the ground, which will prove detrimental to any succeeding corn, whether wheat or barley. To avoid which inconvenience, let the land be harrowed, and turn the swine in to glean the few that may be left by their negligence.

By this method, the sets will be 15 square inches from each other; it will take 18 bushels to plant an acre; and the produce, if on a good mixed loamy soil, will amount to 300 bushels.

If the potatoes are grown as a preparation for wheat, it is preferable to have the rows two feet two inches from each other; hand-hoeing only the space from plant to plant in each row; then turning a small furrow from the inside of each row by a common light plough, and afterwards with a double-breasted plough with one horse, split the ridge formed by the first ploughing thoroughly to clean the intervals. This work should not be done too deep the first time, to avoid burying the tender plants; but the last earth should be ploughed as deep a possible; and the closer the mould is thrown to the stems of the plants, the more advantageous it will prove. Thus 15 bushels will plant an acre, and the produce will be about 300 bushels; but the land, by the summer ploughings, will be prepared to receive seed-wheat immediately, and almost

160 ensure a plentiful crop.

To prevent the grub, The potato-sets should be cut a week before planting, with one or two eyes to each, and the pieces not very small; two bushels of fresh slacked lime should be sown over the surface of the land as soon as planted, which will effectually prevent the attacks of the grub.

The expence attending an acre of potatoes well cultivated in the first method, supposing the rent 20 shillings, tithe and town charges rather high (as in Suffolk), taking up, and every thing included, will be about six pounds. In the last method, it would be somewhat reduced.

"When predilections for old customs are subdued (adds the author), I hope to see the potato admitted in the constant course of crops by every spirited husbandman. The most beneficial effects will, I am certain, accrue from such a system. The advantages in my neighbourhood are apparent; I cultivated and fed my own children upon them, and my poorer neighbours sensibly followed the example. A great proportion of evry cottager's garden is now occupied by this root, and it forms a principal part of their diet. Potatoes are cheap and excellent substitutes for pease in soups and broths, allowing double the quantity. 161

"Although it is nearly a transcript of the directions given by a very ingenious author, yet I shall take the liberty of inserting a receipt for making a potato-soup, which I have weekly distributed amongst the poor to their great relief. A cheap preparation for the poor.

	s.	d.
An ox's head - - -	2	9
Two pecks of potatoes - -	0	6
Quarter of a peck of onions - -	0	3
Three quarters of a pound of salt -	0	1
An ounce and a half of pepper -	0	3
Total	3	10

Ninety pints of water to be boiled with the above ingredients on a slow fire until reduced to 60, which require one peck of coals, value threepence. I have added the expence of every article according to their prices with me, that gentlemen may nearly perceive at how easy a rate they can feed 60 of their poor neighbours. I find from experience, a pint of this soup, with a small piece of the meat, is sufficient to satisfy a hearty working man with a good meal. If vegetables are plentiful, some of every sort may be added, with a few sweet herbs.

"I hope my inserting the above, will not be esteemed improper; though somewhat deviating from the culture of potatoes, it may possibly be a means of rendering them more extensively useful."

A premium having been offered by the abovementioned Society for the cultivation of potatoes by farmers, &c. whose rent does not exceed 40l. per annum, the following methods were communicated, by which those who have only a small spot of ground may obtain a plentiful crop. 162

First, then, the earth should be dug 12 inches deep, if the soil will allow of it; after this, a hole should be opened about six inches deep, horse-dung, or long litter should be put therein about three inches thick; this hole should not be more than 12 inches in diameter; upon this dung or litter, a potato should be planted whole, upon which a little more dung should be shook, and then earth must be put thereon. In like manner the whole plot of ground must be planted, taking care that each potato be at least 16 inches apart; and when the young shoots make their appearance, they should have fresh mould drawn round them with a hoe; and if the tender shoots are covered, it will prevent the frost from injuring them: they should again be earthed when the shoots make a second appearance, but not be covered, as in all probability the season will then be less severe. A plentiful supply of mould should be given them, and the person who performs this business should never tread upon the plant, or the hillock that is raised round it; as the lighter the earth is, the more room the potato will have to expand. From a single root thus planted, very near 40 pounds weight of large potatoes were obtained, and from almost every other root upon the same plot of ground from 15 to 20 pounds weight; and except the soil be stoney or gravelly, 10 pounds or half a peck of potatoes may almost always be obtained from each root, by pursuing the Methods of cultivating potatoes on small spots.

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the foregoing method. But note, cuttings or small sets will not do for this purpose.

163 Methods of culture adapted to small farms. The second method will suit the indolent, or those who have not time to dig their ground, and that is, where weeds much abound and have not been cleared in the winter, a trench may be opened in a straight line the whole length of the ground, and about six inches deep; in this trench the potatoes should be planted about 10 inches apart; cuttings or small potatoes will do for this method. When they are laid in the trench, the weeds that are on the surface may be pared off on each side about 10 inches from it, and be turned upon the plants; another trench should then be dug, and the mould that comes out of it turned carefully on the weeds. It must not be forgot, that each trench should be regularly dug, that the potatoes may be throughout the plot 10 or 12 inches from each other. This slovenly method will in general raise more potatoes than can be produced by digging the ground twice, and dibbling in the plants; and the reason is, that the weeds lighten the soil, and give the roots room to expand. They should be twice hoed, and earthed up in rows. And here note, that if cut potatoes are to be planted, every cutting should have two eyes, for though fewer sets will be obtained, there will be a greater certainty of a crop, as one eye often fails or is destroyed by grubs in the earth.

Where a crop of potatoes fail in part (as will sometimes be the case in a dry season), amends may still be made by laying a little dung upon the knots of the straw or haulm of those potatoes that do appear, and covering them with mould; each knot or joint thus ordered will, if the weather prove wet afterwards, produce more potatoes than the original roots.

From the smallest potatoes planted whole, from four to six pounds at a root were obtained, and some of the single potatoes weighed near two pounds. These were dug in as before-mentioned, in trenches where the ground was covered with weeds, and the soil was a stiff loamy clay.

A good crop may be obtained by laying potatoes upon turf at about 12 or 14 inches apart, and upon beds of about six feet wide; on each side of which a trench should be opened about three feet wide, and the turf that comes from thence should be laid with the grassy side downwards upon the potatoes; a spit of mould should next be taken from the trenches, and be spread over the turf; and in like manner the whole plot of ground that is designed to be planted must be treated. And remark, that when the young shoots appear, another spit of mould from the trenches should be strewed over the beds so as to cover the shoots; this will prevent the frost from injuring them, encourage them to expand, and totally destroy the young weeds; and when the potatoes are taken up in the autumn, a careful person may turn the earth again into the trenches, so as to make the surface level; and it will be right to remark, that from the same ground a much better crop of potatoes may be obtained the following year.

For field planting, a good (if not the best) method is to dung the land, which should be once ploughed previous thereto; and when it is ploughed a second time, a careful person should drop the potato plants before the plough in every third furrow at about eight or ten inches apart. Plants that are cut with two eyes are best for this purpose. The reason for planting them at so great a distance as every third furrow, is, that when the shoots appear, a horse-hoe may go upon the two vacant furrows to keep them clean; and after they are thus hoed, they should be moulded up in ridges; and if this crop be taken up about October or November, the land will be in excellent condition to receive a crop of wheat. Lands that are full of twitch or couch-grass may be made clean by this method, as the horse-hoeing is as good as a summer-fallow; and if, when the potatoes are taken up, women and children were to pick out such filth, not any traces of it would remain; and by laying it on heaps and burning it, a quantity of ashes would be produced for manure.

After ploughing, none should ever dibble in potatoes, as the persons who dibble, plant, or hoe them, will all tread the ground; by which means it will become so bound, that the young fibres cannot expand, as has been already observed. Good crops have indeed been obtained by ploughing the land twice, and dropping the plants in every other furrow, and by hand-hoeing and earthing them up afterwards as the gardeners do pease; but this method is not equal to the other.

Vacant places in hedge-rows might be grubbed and planted with potatoes, and a good crop might be expected, as the leaves of trees, thorns, &c. are a good manure, and will surprisingly encourage their growth, and gratify the wishes of the planter; who by cultivating such places, will then make the most of his ground, and it will be in fine order to receive a crop of corn the following year.

Account of the culture, expences, and produce of six acres of potatoes, being a fair part of near 70 acres, raised by John Billingsley, Esq; and for which the premium was granted him in the year 1784. 164 Method of culture, &c. for which a premium was granted.

Expences.	L.	s.	d.
Ploughing on oat-stubble in October 1783, at 4s. per acre	1	4	0
Cross-ploughing in March 1784	1	4	3
Harrowing, 2s. per acre	0	12	0
180 cart-loads of compost, 3l. per acre	18	0	0
42 sacks of seed-potatoes (each sack weighing 240 lb.) of the white sort	10	10	0
Cutting the sets, 6d. per sack	1	1	0
Setting on ridges eight feet wide (leaving an interval of two feet for an alley) 6d. for every 20 yards.	10	12	0
Hoeing, at 5s. per acre	1	10	0
Digging up the two feet interval, and throwing the earth on the plants, at 10s. per acre	3	0	0
Digging up the crop, at 8d. for every 20 yards in length, the breadth being 8 feet	14	6	0
Labour and expence of securing in pits, wear and tear of baskets, straw, reed, spikes, &c. 10s. per acre	3	0	0
Rent	6	0	0
Tithe	1	10	0
	72	9	0
Profit	73	11	0
	L. 146	0	0

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Produce.		L.	s.	d.
600 facks of beft potatoes at 4s.	-	120	0	0
130 facks middle-fized, 3s. 6d.	-	21	0	0
50 of fmall, 2s.	-	5	0	0
N. B. Each fack 240 lb.				
		L. 146	0	0

The field on which the above experiment was made, was an oat-ftubble in the autumn of 1783. In October it was ploughed, and left in a rough ftate during the winter. In April it was crofs-ploughed and harrowed. On the 8th of May the field was marked out into beds or ridges eight feet wide, leaving a fpace of two feet wide for an alley between every two ridges. The manure (a compoft of ftable dung, virgin earth, and fcrapings of a turnpike road) was then brought on the land, and depofited in fmall heaps on the centre of each ridge, in the proportion of about 30 cart-loads to each acre. A trench was then opened with a fpade breadth-way of the ridge, about four inches deep; in this trench the potato-fets were placed, at the diftance of nine inches from each other; the dung was then fpread in a trench on the fets, and a fpace or plit of 14 inches in breadth, dug in upon them. When the plants were about fix inches high, they were carefully hoed, and foon after the two feet intervals between the ridges were dug, and the contents thrown around the young plants. This refrefhment, added to the ample manuring privoufly beftowed, produced fuch a luxuriance and rapidity of growth, that no weed could fhow its head.

165 Beft method of taking them up.

the fhorteft and moft certain method of taking up potatoes, is to plough once round every row at the diftance of four inches, removing the earth from the plants, and gathering up with the hand all the potatoes that appear. The diftance is made four inches, to prevent cutting the roots, which are feldom found above that diftance from the row on each fide. When the ground is thus cleared by the plough, raife the potatoes with a fork having three broad toes or claws; which is better than a fpade, as it does not cut the potatoes. The potatoes thus laid above ground muft be gathered with the hand. By this method fcarce a potato will be left.

166 Of preferving them.

As potatoes are a comfortable food for the poor people, it is of importance to have them all the year round. For a long time, potatoes in Scotland were confined to the kitchen-garden; and after they were planted in the field, it was not imagined at firft that they could be ufed after the month of December. Of late years they have been found to anfwer even till April; which has proved a great fupport to many a poor family, as they are eafily cooked, and require neither kiln nor mill. But there is no caufe for ftopping there. It is eafy to preferve them till the next crop: When taken out of the ground, lay in the corner of a barn a quantity that may ferve till April, covered from froft with dry ftraw preffed down: bury the remainder in a hole dug in dry ground, mixed with the hufks of dried oats, fand, or the dry leaves of trees, over which build a ftack of hay or corn. When the pit is opened for taking out the potatoes, the eyes of what have a tendency to pufh muft be cut out; and this cargo will ferve all the month of June. To be ftill more certain of making the old crop meet the new, the fetting of a fmall quantity may be delayed till June, to be taken up at the ordinary time before froft. This cargo, having not arrived to full growth, will not be fo ready to pufh as what are fet in April.

If the old crop happen to be exhaufted before the new crop is ready, the interval may be fupplied by the potatoes of the new crop that lie next the furface, to be picked up with the hand; which, far from hurting the crop, will rather improve it.

3. Carrot and Pasnip.

167 Culture of carrot.

Of all roots, a carrot requires the deepeft foil. It ought at leaft to be a foot deep, all equally good from top to bottom. If fuch a foil be not in the farm, it may be made artificially by trench-ploughing, which brings to the furface what never had any communication with the fun or air. When this new foil is fufficiently improved by a crop or two with dung, it is fit for bearing carrots. Beware of dunging the year when the carrots are fown; for with frefh dung they feldom efcape rotten fcabs.

The only foils proper for that root, are a loam and a fandy foil.

The ground muft be prepared by the deepeft furrow that can be taken, the fooner after harveft the better; immediately upon the back of which, a ribbing ought to fucceed, as directed for barley. At the end of March, or beginning of April, which is the time for fowing the feed, the ground muft be fmoothed with a brake. Sow the feed in drills, with intervals of a foot for hand-hoeing; which is no expenfive operation where the crop is confined to an acre or two: but if the quantity of ground be greater, the intervals ought to be three feet, in order for horfe-hoeing.

In flat ground without ridges, it may be proper to make parallel furrows with the plough, ten feet from each other, in order to carry off any redundant moifture.

At Parlington in Yorkfhire, from the end of September to the firft of May, 20 work-horfes, four bullocks, and fix milk-cows, were fed on the carrots that grew on three acres; and thefe animals never tafted any other food but a little hay. The milk was excellent: and, over and above, 30 hogs were fattened upon what was left by the other beafts. We have this fact from undoubted authority.

168 Parfnips.

The culture of parfnips is the fame with that of carrots.

III. Plants cultivated for Leaves, or for both Leaves and *Root*.

There are many garden-plants of thefe kinds. The plants proper for the field are cabbage, red and white, colewort plain and curled, turnip-rooted cabbage, and the root of fcarcity.

1. Cabbage is an interefting article in hufbandry. It is eafily raifed, is fubject to few difeafes, refifts froft more than turnip, is palatable to cattle, and fooner fills them than turnip, carrot, or potatoes.

169 Culture of cabbage.

The feafon for fetting cabbage depends on the ufe it is intended for. If intended for feeding in November, December, and January, plants procured from feed fown the end of July the preceding year muft be fet in March or April. If intended for feeding in March, April, and May, the plants muft be fet the firft week

Practice. week of the preceding July, from seed sown in the end of February or beginning of March the same year. The late setting of the plants retards their growth; by which means they have a vigorous growth the following spring. And this crop makes an important link in the chain that connects winter and summer green food. Where cabbage for spring-food happens to be neglected, a few acres of rye, sown at Michaelmas, will supply the want. After the rye is consumed, there is time sufficient to prepare the ground for turnip.

And now to prepare a field for cabbage. Where the plants are to be set in March, the field must be made up after harvest, in ridges three feet wide. In that form let it lie all winter, to be mellowed with air and frost. In March, take the first opportunity, between wet and dry, to lay dung in the furrows. Cover the dung with a plough, which will convert the furrow into a crown, and consequently the crown into a furrow. Set the plants upon the dung, distant from each other three feet. Plant them so as to make a straight line across the ridges, as well as along the furrows, to which a gardener's line stretched perpendicularly across the furrows will be requisite. This will set each plant at the distance precisely of three feet from the plants that surround it. The purpose of this accuracy is to give opportunity for ploughing, not only along the ridges, but cross them. This mode is attended with three signal advantages: it saves hand-hoeing, it is a more complete dressing to the soil, and it lays earth neatly round every plant.

If the soil be deep and composed of good earth, a trench ploughing after the preceding crop will not be amiss; in which case, the time for dividing the field into three-feet ridges, as above, ought to be immediately before the dunging for the plants.

If weeds happen to rise so close to the plants as not to be reached by the plough, it will require very little labour to destroy them with a hand-hoe.

Unless the soil be much infested with annuals, twice ploughing after the plants are set will be a sufficient dressing. The first removes the earth from the plants; the next, at the distance of a month or so, lays it back.

Where the plants are to be set in July, the field must be ribbed as directed for barley. It ought to have a slight ploughing in June before the planting, in order to loosen the soil, but not so as to bury the surface-earth; after which the three-feet ridges must be formed, and the other particulars carried on as directed above with respect to plants that are to be set in March.

170 Cultivation of the turnip-rooted cabbages.

2. As to the *turnip-rooted cabbages*, their importance and value seem only to have been lately ascertained. In the Bath Society Papers we have the following account of Sir Thomas Beevor's method of cultivating them; which from experience he found to be cheaper and better than any other.

"In the first or second week of June, I sow the same quantity of seed, hoe the plants at the same size, leave them at the same distance from each other, and treat them in all respects like the common turnip. In this method I have always obtained a plentiful crop of them; to ascertain the value of which I need only inform you, that on the 23d day of April last, having than two acres left of my crop, sound, and in great perfection, I divided them by fold hurdles into three parts of nearly equal dimensions. Into the first part I put 24 small bullocks of about 30 stone weight each (14lb. to the stone), and 30 middle-sized fat wethers, which, at the end of the first week, after they had eaten down the greater part of the leaves, and some part of the roots, I shifted into the second division, and then put 70 lean sheep into what was left of the first; these fed off the remainder of the turnips left by the fat stock; and so they were shifted through the three divisions, the lean stock following the fat as they wanted food, until the whole was consumed.

171 Their utility and value.

"The 24 bullocks and 30 fat weathers continued in the turnips until the 21st of May, being exactly four weeks; and the 70 lean sheep until the 29th, which is one day over four weeks: so that the two acres kept my 24 small bullocks and 110 sheep four weeks (not reckoning the overplus day of keeping the lean sheep); the value, at the rate of keeping at that season, cannot be estimated in any common year at less that 4d. a-week for each sheep, and 1s. 6d. per week for each bullock, which would amount together to the sum of L. 14 : 10 : 8 : for the two acres.

"You will hardly, I conceive, think I have set the price of keeping the stock at two high a rate; it is beneath the price here in almost every spring, and in this last it would have cost double, could it have been procured; which was so far from being the case, that hundreds of sheep and lambs here were lost, and the rest greatly pinched for want of food.

"You will observe, gentlemen, that in the valuation of the crop abovementioned I have claimed no allowance for the great benefit the farmer receives by being enabled to suffer his grass to get into a forward growth, nor for the superior quality of these turnips in fattening his stock; both which circumstances must stamp new and a great additional value upon them. But as their continuance on the land may seem to be injurious to the succeeding crop, and indeed will deprive the farmer totally of either oats or barley; so to supply that loss I have always sown buck-wheat on the first earth upon the land from which the turnips were thus fed off; allowing one bushel of seed per acre, for which I commonly receive from five to six quarters per acre in return. And that I may not throw that part of my land out of the same course of tillage with the rest, I sow my clover or other grass-seeds with the buck-wheat, in the same manner as with the oat or barley crops, and have always found as good a *layer* (lea) of it afterwards.

"Thus you see, that in providing a most incomparable vegetable food for cattle, in that season of the year in which the farmer is generally most distressed, and his cattle almost starved, a considerable profit may likewise be obtained, much beyond what is usually derived from his former practice, by the great produce and price of a crop raised at so easy an expence as that of buck-wheat, which, with us, sells commonly at the same price as barley, oftentimes more, and but very rarely for less.

"The land on which I have usually sown turnip-rooted cabbages is a dry mixed soil, worth 15s. per acre.

To the preceding account the Society have subjoined the following note: "Whether we regard the importance

Practice. portance of the subject, or the clear and practical information which the foregoing letter conveys, it may be considered as truly interesting as any we have ever been favoured with: and therefore it is recommended in the strongest manner to farmers in general, that they adopt a mode of practice so decisively ascertained to be in a high degree judicious and profitable."

172 Recommendation by the Bath Society.

To raise the turnip-rooted cabbage for transplanting, the best method yet discovered is, to breast-plough and burn as much old pasture as may be judged necessary for the seed-bed; two perches well stocked with plants will be sufficient to plant an acre. The land should be dug as shallow as possible, turning the ashes in; and the seed should be sown the beginning of April.

173 To raise the turnip-rooted cabbage for transplanting.

The land intended for the plantation to be cultivated and dunged as for the common turnip. About Midsummer (or sooner if the weather will permit) will be a proper time for planting, which is best done in the following manner: the land to be thrown into *one-bout* ridges, upon the tops of which the plants are to be set, at about 18 inches distance from each other. As soon as the weeds rise, give a hand-hoeing, afterwards run the ploughs in the intervals, and fetch a furrow from each ridge, which, after laying a fortnight or three weeks, is again thrown back to the ridges; if the weeds rise again, it is necessary to give them another hand-hoeing.

If the young plants in the seed-bed should be attacked by the fly, sow wood ashes over them when the dew is on, which will effectually prevent the ravages they would otherwise make.

174 Culture of the root of scarcity.

3. The *racine de disette*, or root of scarcity, (*Beta cicla*) delights in a rich loamy land well dunged. It is directed to be sown in rows, or broad-cast, and as soon as the plants are of the size of a goose-quill, to be transplanted in rows of 18 inches distance, and 18 inches a part, one plant from the other: care must be taken in the sowing, to sow very thin, and to cover the seed, which lays in the ground about a month, an inch only.—In transplanting, the root is not to be shortened, but the leaves cut at the top; the plant is then to be planted with a setting stick, so that the upper part of the root shall appear about half an inch out of the ground; this last precaution is very necessary to be attended to. These plants will strike root in twenty-four hours, and a man a little accustomed to planting, will plant with ease 1800 or 2000 a-day. In the seed-bed, the plants, like all others must be kept clear of weeds: when they are planted out, after once hoeing, they will take care of themselves, and suffocate every kind of weed near them.

The best time to sow the seed is from the beginning of March to the middle of April: it is, however, advised to continue sowing every month until the beginning of July, in order to have a succession of plants. Both leaves and roots have been extolled as excellent both for man and beast. This plant is said not to be liable, like the turnip, to be destroyed by insects, for no insect touches it, nor is it affected by excessive drought, or the changes of seasons. Horned cattle, horses, pigs, and poultry, are exceedingly fond of it when cut small. The leaves may be gathered every 12 or 15 days; they are from 30 to 40 inches long, by 22 to 25 inches broad. This plant is excellent for milch cows, when given to them in proper proportions, as it adds much to the quality as well as quantity of their milk; but care must be taken to proportion the leaves with other green food, otherwise it would abate the milk, and fatten them too much, it being of so exceeding fattening a quality. To put all these properties beyond doubt, however, further experiments are wanting.

Sect. IV. *Culture of Grass.*

175 Of laying down fields to grass.

The latter end of August, or the beginning of September, is the best season for sowing grass-seeds, as there is time for the roots of the young plants to fix themselves before the sharp frosts set in. It is scarce necessary to say, that moist weather is best for sowing; the earth being then warm, the seeds will vegetate immediately; but if this season prove unfavourable, they will do very well the middle of March following.

If you would have fine pasture, never sow on foul land. On the contrary, plough it well, and clear it from the roots of couch-grass, rest-harrow, fern, broom, and all other noxious weeds. If these are suffered to remain, they will soon get above, and destroy your young grass. Rake these up in heaps, and burn them on the land, and spread the ashes as a manure. These ploughings and harrowings should be repeated in dry weather. And if the soil be clayey and wet, make some under-drains to carry off the water, which, if suffered to remain, will not only chill the grass, but make it sour. Before sowing, lay the land as level and fine as possible. If your grass-seeds are clean, (which should always be the case) three bushels will be sufficient per acre. When sown, harrow it in gently, and roll it in with a wooden roller. When it comes up, fill up all the bare spots by fresh seed, which, if rolled to fix it, will soon come up, and overtake the rest.

In Norfolk they sow clover with their grasses, particularly with rye-grass; but this should not be done except when the land is designed for grass only three or four years, because neither of these kinds will last long in the land. Where you intend it for a continuance, it is better to mix only small white Dutch clover, or marle grass, with your other grass seed, and not more than eight pounds to an acre. These are abiding plants, spread close on the surface, and make the sweetest feed of any for cattle. In the following spring, root up thistles, hemlock, or any large plants that appear. The doing this while the ground is soft enough to permit your drawing them by the roots, and before they seed, will save you infinite trouble afterwards.

The common method of proceeding in laying down fields to grass is extremely injudicious. Some sow barley with their grasses, which they suppose to be useful in shading them, without considering how much the corn draws away the nourishment from the land.

176 Different kinds of grass.

Others take their seeds from a foul hay-rick; by which means, besides filling the land with rubbish and weeds, what they intend for dry soils may have come from moist, where it grew naturally, and *vice versa*. The consequence is, that the ground, instead of being covered with a good thick sward, is filled with plants unnatural to it. The kinds of grass most eligible for pasture-lands are, the annual-meadow, creeping, and fine bent, the fox-tails, and crested dog's-tail, the poas, the fescues, the vernal, oat-grass.

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grass, and the ray, or rye-grass. We do not, however, approve of sowing all these kinds together; for not to mention their ripening at different times, by which means you can never cut them all in perfection and full vigour, no kind of cattle are fond of all alike.

Horses will scarcely eat hay which oxen and cows will thrive upon; sheep are particularly fond of some kinds, and refuse others. The Darnel-grass, if not cut before several of the other kinds are ripe, becomes so hard and wiry in the stalks, that few cattle care to eat it.

Such gentlemen as wish a particular account of the abovementioned grasses, will be amply gratified in consulting Mr Stillingfleet on this subject. He has treated it with great judgment and accuracy, and those who follow his directions in the choice of their grasses will be under no small obligation to him for the valuable information he has given them. The substance of his observations are given in the article GRASSES in this Dictonary.

The grasses commonly sown for pasture, for hay, or to cut green for cattle, are red clover, white clover, yellow clover, rye-grass, narrow-leaved plantain commonly called *ribwort*, sain-foin, and lucerne.

Red clover is of all the most proper to be cut green for summer-food. It is a biennial plant when suffered to perfect its seed; but when cut green, it will last three years, and in a dry soil longer. At the same time the safest course is to let it stand but a single year: if the second year's crop happen to be scanty, it proves, like a bad crop of pease, a great encourager of weeds by the shelter it affords them.

Here, as in all other crops, the goodness of seed is of importance. Choose plump seed of a purple colour, because it takes on that colour when ripe. It is red when hurt in the drying, and of a faint colour when unripe.

177 Of red clover.

Red clover is luxuriant upon a rich soil, whether clay, loam, or gravel; it will grow even upon a moor, when properly cultivated. A wet soil is its only bane; for there it does not thrive.

To have red clover in perfection, weeds must be extirpated, and stones taken off. The mould ought to be made as fine as harrowing can make it; and the surface be smoothed with a light roller, if not sufficiently smooth without it. This gives opportunity for distributing the seed evenly: which must be covered by a small harrow with teeth no larger than that of a garden-rake, three inches long, and six inches asunder.* In harrowing, the man should walk behind with a rope in his hand fixed to the back part of the harrow, ready to disentangle it from stones, clods, turnip or cabbage-roots, which would trail the seed, and displace it.

* Plate V. fig. 7.

Nature has not determined any precise depth for the seed of red clover more than for other seed. It will grow vigorously from two inches deep, and it will grow when barely covered. Half an inch may be reckoned the most advantageous position in clay soil, a whole inch in what is light or loose. It is a vulgar error, that small seed ought to be sparingly covered. Misled by that error, farmers commonly cover their clover-seed with a bushy branch of thorn; which not only covers it unequally, but leaves part on the surface to wither in the air.

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The proper season for sowing red-clover, is from the middle of April to the middle of May. It will spring from the first of March to the end of August; but such liberty ought not to be taken except from necessity.

There cannot be a greater blunder in husbandry, than to be sparing of seed. Ideal writers talk of sowing an acre with four pounds. That quantity of seed, say they, will fill an acre with plants as thick as they ought to stand. This rule may be admitted where grain is the object; but it will not answer with respect to grass. Grass-seed cannot be sown too thick: the plants shelter one another: they retain all the dew: and they must push upwards, having no room laterally. Observe the place where a sack of pease, or of other grain, has been set down for sowing: the seed dropt there accidentally grows more quickly than in the rest of the field sown thin out of hand. A young plant of clover, or of sain-foin, according to Tull, may be raised to a great size where it has room; but the field will not produce half the quantity. When red clover is sown for cutting green, there ought not to be less than 24 pounds to an acre. A field of clover is seldom too thick: the smaller a stem be, the more acceptable it is to cattle. It is often too thin; and when so, the stems tend to wood.

178 Of sowing clover with grain.

Red clover is commonly sown with grain; and the most proper grain has been found by experience to be flax. The soil must be highly cultivated for flax as well as for red clover. The proper season for sowing is the same for both; the leaves of flax being very small, admit of free circulation of air; and flax being an early crop, is removed so early as to give the clover time for growing. In a rich soil it has grown so fast, as to afford a good cutting that very year. Next to flax, barley is the best companion to clover. The soil must be loose and free for barley: and so it ought to be for clover: the season of sowing is the same; and the clover is well established in the ground, before it is over-topped by the barley. At the same time, barley commonly is sooner cut than either oats or wheat. In a word, barley is rather a nurse than a stepmother to clover during its infancy. When clover is sown in spring upon wheat, the soil, which has lain five or six months without being stirred, is an improper bed for it; and the wheat, being in the vigour of growth, overtops it from the beginning. It cannot be sown along with oats, because of the hazard of frost; and when sown as usual among the oats three inches high, it is over-topped, and never enjoys free air till the oats be cut. Add, that where oats are sown upon the winter furrow, the soil is rendered as hard as when under wheat.—Red clover is sometimes sown by itself without other grain: but this method, beside losing a crop, is not salutary; because clover in its infant state requires shelter.

As to the quantity of grain proper to be sown with clover: In a rich soil well pulverized, a peck of barley on an English acre is all that ought to be ventured. Two Linlithgow firlots make the proper quantity for an acre that produces commonly six bolls of barley; half a firlot for what produces nine bolls. To those who are governed by custom, so small a quantity will be thought ridiculous. Let them only consider, that a rich soil in perfect good order, will from a single seed

of

Practice. of barley produce 20 or 30 vigorous stems. People may flatter themselves with the remedy of cutting barley green for food, if it happens to oppress the clover. This is an excellent remedy in a field of an acre or two; but the cutting an extensive field for food must be slow; and while one part is cutting, the clover is smothered in other parts.

179 White and yellow clover, ribwort, and rye-grass.

The culture of white clover, of yellow clover, of ribwort, of rye-grass, is the same in general with that of red clover. We proceed to their peculiarities. Yellow clover, ribwort, rye-grass, are all of them early plants, blooming in the end of April or beginning of May. The two latter are evergreens, and therefore excellent for winter pasture. Rye-grass is less hurt by frost than any of the clovers, and will thrive in a moister soil: nor in that soil is it much affected by drought. In a rich soil, it grows four feet high: even in the dry summer 1775, it rose to three feet eight inches; but it had gained that height before the drought came on. These grasses are generally sown with red clover for producing a plentiful crop. The proportion of seed is arbitrary; and there is little danger of too much. When rye-grass is sown for procuring seed, five firlots wheat-measure may be sown on an acre; and for procuring seed of ribwort, 40 pounds may be sown. The roots of rye-grass spread horizontally: they bind the soil by their number; and tho' small, are yet so vigorous as to thrive in hard soil. Red clover has a large tap-root, which cannot penetrate any soil but what is open and free; and the largeness of the root makes the soil still more open and free. Rye-grass, once a great favourite, appears to be discarded in most parts of Britain. The common practice has been, to sow it with red clover, and to cut them promiscuously the beginning of June for green food, and a little later for hay. This indeed is the proper season for cutting red clover, because at that time it begins to flower; but as at that time the seed of the rye-grass is approaching to maturity, its growth is stopped for that year, as much as of oats or barley cut after the seed is ripe. Oats or barley cut green before the seed forms, will afford two other cuttings; which is the case of rye-grass, of yellow clover and of ribwort. By such management, all the profit will be drawn that these plants can afford.

When red clover is intended for seed, the ground ought to be cleared of weeds, were it for no other purpose than that the seed cannot otherwise be preserved pure: what seeds escape the plough ought to be taken out by the hand. In England, when a crop of seed is intended, the clover is always first cut for hay. This appears to be done, as in fruit-trees, to check the growth of the wood, in order to encourage the fruit. This practice will not answer in Scotland, as the seed would often be too late for ripening. It would do better to eat the clover with sheep till the middle of May, which would allow the seed to ripen. The seed is ripe when, upon rubbing it between the hands, it parts readily from the husk. Then apply the scythe, spread the crop thin, and turn it carefully. When perfectly dry, take the first opportunity of a hot day for threshing it on boards covered with a coarse sheet. Another way less subject to risk, is to stack the dry hay, and to thresh it in the end of April. After the first threshing, expose the husks to the sun, and thresh them over and over till no seed remain. Nothing is more efficacious than a hot sun to make the husk part with its seed; in which view it may be exposed to the sun by parcels, an hour or two before the flail is applied.

White clover intended for seed, is managed in the same manner. No plant ought to be mixed with rye-grass that is intended for seed. In Scotland, much rye-grass seed is hurt by transgressing that rule. The seed is ripe when it parts easily with the husk. The yellowness of the stem is another indication of its ripeness; in which particular it resembles oats, barley, and other culmiferous plants. The best manner to manage a crop of rye-grass for seed, is to bind it loosely in small sheaves, widening them at the bottom to make them stand erect; as is done with oats in moist weather. In that state they may stand till sufficiently dry for threshing. By this method they dry more quickly, and are less hurt by rain, than by close binding and putting the sheaves in shocks like corn. The worst way of all is to spread the rye-grass on the moist ground, for it makes the seed malten. The sheaves, when sufficiently dry, are carried in close carts to where they are to be threshed on a board, as mentioned above for clover. Put the straw in a rick when a hundred stone or so are threshed. Carry the threshing-board to the place where another rick is intended; and so on till the whole seed be threshed, and the straw ricked. There is necessity for close carts to save the seed, which is apt to drop out in a hot sun; and, as observed above a hot sun ought always to be chosen for threshing. Carry the seed in sacks to the granary or barn, there to be separated from the husks by a fanner. Spread the seed thin upon a timber-floor, and turn it once or twice a-day till perfectly dry. If suffered to take a heat, it is useless for seed.

180 Culture of sainfoin.

The writers on agriculture reckon sainfoin preferable to clover in many respects: They say, that it produces a larger crop; that it does not hurt cattle when eaten green; that it makes better hay; that it continues four times longer in the ground; and that it will grow on land that will bear no other crop.

Sainfoin has a very long tap-root, which is able to pierce very hard earth. The roots grow very large; and the larger they are, they penetrate to the greater depth; and hence it may be concluded, that this grass, when it thrives well, receives a great part of its nourishment from below the *staple* of the soil: of course, a deep dry soil is best for the culture of sainfoin. When plants draw their nourishment from that part of the soil that is near the surface, it is not of much consequence whether their number be great or small. But the case is very different when the plants receive their food, not only near, but also deep below, the surface. Besides, plants that shoot their roots deep are often supplied with moisture, when those near the surface are parched with drought.

To render the plants of sainfoin vigorous, it is necessary that they be sown thin. The best method of doing this is by a drill; because, when sown in this manner, not only the weeds, but also the supernumerary plants, can easily be removed. It is several years before sainfoin comes to its fullest strength; and the number of plants sufficient to stock a field, while in this imperfect state, will make but a poor crop for the first year or two. It is therefore necessary that it be sown in such a manner as to make it easy to take up plants in in such numbers, and in such order, as always to leave in the field the proper number in their proper places. This can only be done, with propriety, by sowing the plants in rows by a drill. Supposing a field to be drilled in rows at ten inches distance, the partitions may be hand-hoed, and the rows dressed in such a manner as to leave a proper number of plants. In this situation the field may remain two years; then one-fourth of the rows may be taken out in pairs, in such a manner as to make the beds of fifty inches, with six rows in each, and intervals of thirty inches, which may be ploughed. Next year, another fourth of the rows may be taken out in the same manner, so as to leave double rows with partitions of ten inches, and intervals of thirty: All of which may be hoed at once or alternately, as it may be found most convenient.

The great quantity of this grass which the writers on this subject assure us may be raised upon an acre, and the excellency and great value of the hay made of it, should induce farmers to make a complete trial of it, and even to use the spade in place of the hoe, or hoe-plough, if necessary.

The plants taken up from up a field of sainfoin may be set in another field; and if the transplanting of this grass succeeds as well as the transplanting of lucerne has done with Mr Lunin de Chateauvieux, the trouble and expence will be sufficiently recompensed by the largeness of the crops. In transplanting, it is necessary to cut off great part of the long tap-root: this will prevent it from striking very deep into the soil, and make it push out large roots in a sloping direction from the cut end of the tap-root. Sainfoin managed in this manner, will thrive even on shallow land that has a wet bottom, provided it be not overstocked with plants.

Whoever inclines to try the culture of this grass should take great pains in preparing the land, and making it as free from weeds as possible.

In England, as the roots strike deep in that chalky soil, this plant is not liable to be so much injured by drought as other grasses are, whose fibres lie horizontally, and lie near the surface. The quantity of hay produced is greater and better in quality than any other. But there is one advantage attending this grass, which renders it superior to any other; and that arises from feeding with it milch cows. The prodigious increase of milk which it makes is astonishing, being nearly double that produced by any other green food. The milk is also better, and yields more cream than any other; and the butter procured from it much better coloured and flavoured.

The following remarks by an English farmer are made from much experience and observation.

181 Remarks on the culture of sainfoin in England.

Sainfoin is much cultivated in those parts where the soil is of a chalky kind. It will always succeed well where the roots run deep; the worst soil of all for it is where there is a bed of cold wet clay, which the tender fibres cannot penetrate. This plant will make a greater increase of produce, by at least 30 times, than common grass or turf upon poor land. Where it meets with chalk or stone, it will extend it roots through the cracks and chinks to a very great depth in search of nourishment. The dryness is of more consequence than the richness of land for sainfoin; although land that is both dry and rich will always produce the largest crops.

It is very commonly sowed broadcast; but it is found to answer best in drills, especially if the land be made fine by repeated ploughing, rolling, and harrowing. Much depends on the depth which this seed is sown. If it be buried more than an inch deep, it will seldom grow; and if left uncovered, it will push out its roots above ground, and these will be killed by the air. March and the beginning of April are the best seasons for sowing it, as the severity of winter and the drought of summer are equally unfavourable to the young plants. A bushel of seed sown broadcast, or half that quantity in drills, if good, is sufficient for an acre. The drills should be 30 inches apart, to admit of horse-hoeing between them. Much, however, depends on the goodness of the seed, which may be best judged of by the following marks.

The husk being of a bright colour, the kernel plump, of a grey or bluish colour without, and, if cut across, greenish and fresh withinside; if it be thin and furrowed, and of a yellowish cast, it will seldom grow. When the plants stand single, and have room to spread, they produce the greatest quantity of herbage, and the seed ripens best. But farmers in general, from a mistaken notion of all that appears to be waste ground being unprofitable, plant them so close, that they choke and impoverish each other, and often die in a few years. Single plants run deepest and draw most nourishment; they are also easiest kept free from weeds. A single plant will often produce half a pound of hay, when dry. On rich land this plant will yield two good crops in a year, with a moderate share of culture. A good crop must not be expected the first year; but, if the plants stand not too thick, they will increase in size the second year prodigiously.

No cattle should be turned on the field the first winter after the corn is off with which it is sown, as their feet would injure the young plants. Sheep should not come on the following summer, because they would bite off the crown of the plants, and prevent their shooting again. A small quantity of soapers ashes as a top-dressing will be of great service, if laid on the first winter.

If the sainfoin be cut just before it comes into bloom, it is admirable food for horned cattle; and if cut thus early, it will yield a second crop the same season. But if it proves a wet season, it is better to let it stand till its bloom be perfected; for great care must be taken, in making it into hay, that the flowers do not drop off, as cows are very fond of them; and it requires more time than other hay in drying. Sainfoin is so excellent a fodder for horses, that they require no oats while they eat it, although they be worked hard all the time. Sheep will also be fattened with it faster than with any other food.

If the whole season for cutting proves very rainy, it is better to let the crop stand for seed, as that will amply repay the loss of the hay; because it will not only fetch a good price, but a peck of it will go as far as a peck and a half of oats for horses.

The best time of cutting the seeded sainfoin is, when the greatest part of the seed is well filled, the first blown

blown ripe, and the laſt blown beginning to open. For want of this care ſome people have loſt moſt of their ſeed by letting it ſtand too ripe. Seeded ſainfoin ſhould always be cut in a morning or evening, when the dews render the ſtalks tender. If cut when the ſun ſhines hot, much of the ſeed will fall out and be loſt.

182 Its excellence as food for cows.

An acre of very ordinary land, when improved by this graſs, will maintain four cows very well from the firſt of April to the end of November; and afford, beſides, a ſufficient ſtore of hay to make the greater part of their food the four months following.

If the ſoil be tolerably good, a field of ſainfoin will laſt from 15 to 20 years in prime; but at the end of ſeven or eight years, it will be neceſſary to lay on a moderate coat of well rotted dung; or, if the ſoil be very light and ſandy, of marle. By this means the future crops, and the duration of the plants in health and vigour, will be greatly increaſed and prolonged. Hence it will appear, that for poor land there is nothing equal to this graſs in point of advantage to the farmer.

Clover will laſt only two years in perfection; and often, if the ſoil be cold and moiſt, near half the plants will rot, and bald patches be found in every part of the field the ſecond year. Beſides, from our frequent rains during the month of September, many crops left for feeding are loſt. But from the quantity and excellent quality of this graſs (ſainfoin), and its ripening earlier, and continuing in vigour ſo much longer, much riſk and certain expence is avoided, and a large annual profit accrues to the farmer.

183 Culture of lucerne.

The writers on agriculture, ancient as well as modern, beſtow the higheſt encomiums upon lucerene as affording excellent hay, and producing very large crops. Lucerne remains at leaſt 10 or 12 years in the ground, and produces about eight tons of hay upon the Scots acre. There is but little of it cultivated in Scotland. However, it has been tried in ſeveral parts of that country; and it is found, that, when the ſeed is good, it comes up very well, and ſtands the winter froſt. But the chief thing that prevents this graſs from being more uſed in Scotland, is the difficulty of keeping the ſoil open and free from weeds. In a few years the ſurface becomes ſo hard, and the turf ſo ſtrong, that it deſtroys the lucerne before the plants have arrived at their greateſt perfection: ſo that lucerne can ſcarce be cultivated with ſucceſs there, unleſs ſome method be fallen upon of deſtroying the natural graſs, and prevent the ſurface from becoming hard and impenetrable. This cannot be done effectually by any other means than horſe-hoeing. This method was firſt propoſed by Mr Tull, and afterwards practiſed ſucceſsfully by M. de Chateauvieux near Geneva. It may be of uſe therefore to give a view of that gentleman's method of cultivating lucerne.

He does not mention any thing particular as to the manner of preparing the land; but only obſerves in general, that no pains ſhould be ſpared in preparing it. He tried the ſowing of lucerne both in rows upon the beds where it was intended to ſtand, and likewiſe the ſowing it in a nurſery, and afterwards tranſplanting it into the beds prepared for it. He prefers tranſplanting; becauſe, when tranſplanted, part of the tap-root is cut off, and the plant ſhoots out a number of lateral branches from the cut part of the root, which makes it ſpread its roots nearer the ſurface, and conſequently renders it more eaſily cultivated: beſides this circumſtance adapts it to a ſhallow ſoil, in which, if left in its natural ſtate, it would not grow.

The tranſplanting of lucerne is attended with many advantages. The land may be prepared in the ſummer for receiving the plants from the nurſery in autumn; by which means the field muſt be in a much better ſituation than if the ſeed had been ſown upon it in the ſpring. By tranſplanting, the rows can be made more regular, and the intended diſtance more exactly obſerved; and conſequently the hoeing can be performed more perfectly, and with leſs expence. Mr Chateauvieux likewiſe tried the lucerne in ſingle beds three feet wide, with ſingle rows; in beds three feet nine inches wide, with double rows; and in beds four feet three inches wide, with triple rows. The plants in the ſingle rows were ſix inches aſunder, and thoſe in the double and triple rows were about eight or nine inches. In a courſe of three years he found, that a ſingle row produced more than a triple row of the ſame length. The plants of lucerne, when cultivated by tranſplantation, ſhould be at leaſt ſix inches aſunder, to allow them room for extending their crowns.

He further obſerves, that the beds or ridges ought to be raiſed in the middle; that a ſmall trench, two or three inches deep, ſhould be drawn in the middle; and that the plants ought to be ſet in this trench, covered with earth up to the neck. He ſays, that if the lucerne be ſown in the ſpring, and in a warm ſoil, it will be ready for tranſplanting in September; that, if the weather be too hot and dry, the tranſplanting ſhould be delayed till October; and that, if the weather be unfavourable during both theſe months, this operation muſt be delayed till ſpring. He further directs, that the plants ſhould be carefully taken out of the nurſery, ſo as not to damage the roots; that the roots be left only about ſix or ſeven inches long: that the green crops be cut off within about two inches of the crown; that they be put into water as ſoon as taken up, there to remain till they are planted; and that they ſhould be planted with a planting-ſtick, in the ſame manner as cabbages.

He does not give particular directions as to the times of horſe-hoeing; but only ſays in general, that the intervals ſhould be ſtirred once in the month during the whole time that the lucerne is in a growing ſtate. He likewiſe obſerves, that great care ought to be taken not to ſuffer any weeds to grow among the plants, at leaſt for the firſt two or three years; and for this purpoſe, that the rows, as well as the edges of the intervals where the plough cannot go, ſhould be weeded by the hand.

Burnet is peculiarly adapted to poor land: beſides, it proves an excellent winter-paſture, when hardly any thing elſe vegetates. Other advantages are, It makes good butter; it never blows or ſwells cattle; it is fine paſture for ſheep; and will flouriſh well on poor, light, ſandy, or ſtony ſoils, or even on dry chalk hills. 184 Culture of burnet.

The cultivation of it is neither hazardous nor expen-

 five.

Practice. five. If the land is prepared as is generally done for turnips, there is no danger of its failing. After the first year, it will be attended with very little expence, as the flat circular spread of its leaves will keep down, or prevent the growth of weeds.

On the failure of turnips, either from the fly or the black worm, some of our farmers have sown the land with burnet, and in March following had a fine pasture for their sheep and lambs. It will perfect its seed twice in a summer; and this seed is said to be as good as oats for horses; but it is too valuable to be applied to that use.

It is sometimes sown late in the spring with oats and barley, and succeeds very well; but it is best to sow it singly in the beginning of July, when there is a prospect of rain, on a small piece of land, and in October following, transplant it in rows two feet apart, and about a foot distant in the rows. This is a proper distance, and gives opportunity for hoeing the intervals in the succeeding spring and summer.

After it is fed down with cattle, it should be harrowed clean. Some horses will not eat it freely at first but in two or three days they are generally very fond of it. It affords rich pleasant milk, and in great plenty.

A gentleman farmer near Maidstone some years since sowed four acres as soon as the crop of oats was got off, which was the latter end of August. He threw in 12 pounds of seed per acre, broadcast; and no rain falling until the middle of September, the plants did not appear before the latter end of that month. There was however a good crop, and in the spring he set the plants out with a turnip-hoe, leaving them about a foot distant from each other. But the drill method is preferable, as it saves more than half the seed. The land was a poor dry gravel, not worth three shillings an acre for any thing else.

The severest frost never injures this plant: and the oftener it is fed the thicker are its leaves, which spring constantly from its root.

Sect. V. *Rotation of Crops.*

185 Rotation of crops. No branch of husbandry requires more skill and sagacity than a proper rotation of crops, so as to keep the ground always in heart, and yet to draw out of it the greatest profit possible. Some plants rob the soil, others are gentle to it: some bind, others loosen. The nice point is, to intermix crops, so as to make the greatest profit consistently with keeping the ground in trim. In that view, the nature of the plants employed in husbandry must be accurately examined.

186 Culmiferous and leguminous plants, * N° 120. 121. The difference between culmiferous and leguminous plants, is occasionally mentioned above*. With respect to the present subject, a closer inspection is necessary. Culmiferous plants, having small leaves and few in number, depend mostly on the soil for nourishment, and little on the air. During the ripening of the seed, they draw probably their whole nourishment from the soil; as the leaves by this time, being dry and withered, must have lost their power of drawing nourishment from the air. Now, as culmiferous plants are chiefly cultivated for their seed, and are not cut down till the seed be fully ripe, they may be pronounced all of them to be robbers, some more, some less. But such plants, while young, are all leaves; and in that state draw most of their nourishment from the air. Hence it is, that where cut green for food to cattle, a culmiferous crop is far from being a robber. A hay-crop accordingly, even where it consists mostly of rye-grass, is not a robber, provided it be cut before the seed is formed; which at any rate it ought to be, if one would have hay in perfection. And the foggage, excluding the frost by covering the ground, keeps the roots warm. A leguminous plant, by its broad leaves, draws much of its nourishment from the air. A cabbage, which has very broad leaves, and a multitude of them, owes its growth more to the air than to the soil. One fact is certain, that a cabbage cut and hung up in a damp place, preserves its verdure longer than other plants. At the same time, a seed is that part of a plant which requires the most nourishment: and for that nourishment a culmiferous plant must be indebted entirely to the soil. A leguminous crop, on the contrary, when cut green for food, must be very gentle to the ground. Pease and beans are leguminous plants; but being cultivated for seed, they seem to occupy a middle station: their seed makes them more severe than other leguminous crops cut green; their leaves, which grow till reaping, make them less severe than a culmiferous plant left to ripen.

These plants are distinguished no less, remarkably by the following circumstance. All the seeds of a culmiferous plant ripen at the same time. As soon as they begin to form, the plant becomes stationary, the leaves wither, the roots cease to push, and the plant when cut down is blanched and sapless. The seeds of a leguminous plant are formed successively: flowers and fruit appear at the same time in different parts of the plant. This plant accordingly is continually growing, and pushing its roots. Hence the value of bean or pease straw above that of wheat or oats: the latter is withered and dry when the crop is cut; the former, green and succulent. The difference therefore, with respect to the soil, between a culmiferous and leguminous crop, is great. The latter, growing till cut down, keeps the ground in constant motion, and leaves it to the plough loose and mellow. The former gives over growing long before reaping; and the ground, by want of motion, turns compact and hard. Nor is this all. Dew falling on a culmiferous crop after the ground begins to harden, rests on the surface, and is sucked up by the next sun. Dew that falls on a leguminous crop, is shaded from the sun by the broad leaves, and sinks at leisure into the ground. The ground accordingly, after a culmiferous crop, is not only hard, but dry: after a leguminous crop, it is not only loose, but soft and unctuous.

Of all culmiferous plants, wheat is the most severe, by the long time it occupies the ground without admitting a plough. And as the grain is heavier than that of barley or oats, it probably requires more nourishment than either. It is observed above, that as pease and beans draw part of their nourishment from the air by their green leaves while allowed to stand, they draw the less from the ground; and by their constant growing they leave it in good condition for subsequent crops. In both respects they are preferable to any culmiferous crop.

Culmiferous crops, as observed above, are not robbers when cut green: the soil, far from hardening, is kept

Practice. kept in constant motion by the pushing of the roots, and is left more tender than if it had been left at rest without any bearing crop.

Bulbous-rooted plants are above all successful in dividing and pulverizing the soil. Potato-roots grow six, eight, or ten inches under the surface; and, by their size and number, they divide and pulverize the soil better than can be done by the plough; consequently, whatever be the natural colour of the soil, it is black when a potatoe-crop is taken up. The potato, however, with respect to its quality of dividing the soil, must yield to a carrot or parsnip; which are large roots, and pierce often to the depth of 18 inches. The turnip, by its tap-root, divides the soil more than can be done by a fibrous-rooted plant; but as its bulbous root grows mostly above ground, it divides the soil less than the potato, the carrot, or the parsnip. Red clover, in that respect, may be put in the same class with turnip.

Whether potatoes or turnip be the more gentle crop, appears a puzzling question. The former bears seed, and probably draws more nourishment from the soil than the latter, when cut green. On the other hand, potatoes divide the soil more than turnip, and leave it more loose and friable. It appears no less puzzling, to determine between cabbage and turnip: the former draws more of its nourishment from the air, the latter leaves the soil more free and open.

The result of the whole is what follows: Culmiferous plants are robbers; some more, some less: they at the same time bind the soil; some more, some less. Leguminous plants in both respects are opposite; if any of them rob the soil, it is in a very slight degree; and all of them without exception loosen the soil. A culmiferous crop, however, is generally the more profitable: but few soils can long bear the burden of such crops, unless relieved by interjected leguminous crops. These, on the other hand, without a mixture of culmiferous crops, would soon render the soil too loose.

These preliminaries will carry the farmer some length in directing a proper rotation of crops. Where dung, lime, or other manure, can be procured in plenty to recruit the soil after severe cropping, no rotation is more proper or profitable in a strong soil, than wheat, pease or beans, barley, oats, fallow. The whole farm may be brought under this rotation, except so far as hay is wanted. But as such command of manure is rare, it is of more importance to determine what should be the rotation when no manure can be procured but the dung collected in the farm. Considering that culmiferous crops are the more profitable in rich land, it would be proper to make them more frequent than the other kind. But as there are few soils that will admit such frequent culmiferous crops without suffering, it may be laid down as a general rule, that alternate crops, culmiferous and leguminous, ought to form the rotation. Nor are there many soils that will stand good, even with this favourable rotation, unless relieved from time to timeby pasturing a few years. If such extended rotation be artfully carried on, crops without end may be obtained in a tolerable good soil, without any manure but what is produced in the farm.

It is scarce necessary to be mentioned, being known to every farmer that clay answers best for wheat, moist clay for beans, loam for barley and pease, light soil for turnip, sandy soil for rye and buckweat; and that oats thrive better in coarse soil than any other grain. Now, in directing a rotation, it is not sufficient that a culmiferous crop be always succeeded by a leguminous: attention must also be given, that no crop be introduced that is unfit for the soil. Wheat, being a great binder, requires more than any other crop a leguminous crop to follow. But every such crop is not proper: potatoes are the greatest openers of soil; but they are improper in a wheat soil. Neither will turnip answer, because it requires a light soil. A very loose soil, after a crop of rye, requires rye-grass to bind it, or the treading of cattle in pasturing: but to bind the soil, wheat must not be ventured; for it succeeds ill in loose soil.

187 The nature of soil considered, with regard to the rotation of crops.

Another consideration of moment in directing the rotation, is to avoid crops that encourage weeds. Pease is the fittest of all crops for succeeding to wheat, because it renders the ground loose and mellow, and the same soil agrees with both. But beware of pease, unless the soil be left by the wheat perfectly free of weeds; because pease, if not an extraordinary crop, foster weeds. Barley may be ventured after wheat, if the farmer be unwilling to lose a crop. It is indeed a robber; better, however, any crop, than run the hazard of poisoning the soil with weeds. But to prevent the necessity of barley after wheat, the land ought to be fallowed before the wheat: it cleans the ground thoroughly, and makes pease a secure crop after wheat, And after a good crop of pease, barley never fails. A horse-hoed crop of turnip is equal to a fallow for rooting out weeds; but turnip does not suit land that is proper for wheat. Cabbage does well in wheat soil: and a horse-hoed crop of cabbage, which eradicates weeds, is a good preparation for wheat to be succeeded by pease; and a crop of beans diligently hand-hoed, is in that view little inferior. As red clover requires the ground to be perfectly clean, a good crop of it ensures wheat, and next pease. In loam, a drilled crop of turnip or potatoes prepares the ground, equal to a fallow, for the same succession.

Another rule is, to avoid a frequent repetition of the same species; for to produce good crops, change of species is no less necessary than change of seed. The same species returning every second or third year, will infallibly degenerate, and be a scanty crop. This is remarkably the case of red clover. Nor will our fields bear pleasantly perpetual crops of wheat after fallow, which is the practice of some English farmers.

Hitherto of rotation in the same field. We add one rule concerning rotation in different fields; which is to avoid crowding crops one after another in point of time; but to choose such as admit intervals sufficient for lesurely dressing, which gives opportunity to manage all with the same hands, and with the same cattle; for example, beans in January or February, pease and oats in March, barley and potatoes in April, turnip in June or July, wheat and Rye in October.

118 Exceptionable rotations.

For illustrating the foregoing rules, a few instances of exceptionable rotations will not be thought amiss. The following is an usual rotation in Norfolk. First, wheat after red clover. Secondly, barley. Third, turnip. Fourth, barley with red clover. Fifth, clover cut for hay. Sixth, a second year's crop of clover commonly pastured. Dung is given to the wheat and turnip.—Against this rotation several objections lie. Barley after wheat is improper. The two crops of barley are too near together. The second crop of clover must be very bad, if pasturing be the best way of consuming it; and if bad it is a great encourager of weeds. But the strongest objection is, that red clover repeated so frequently in the same field cannot fail to degenerate; and of this the Norfolk farmers begin to be sensible.—Salton in East Lothian is a clay soil; and the rotation there is, Wheat after fallow and dung. Second, barley after two ploughings; the one before winter, the other immediately before the seed is sown. Third, oats. Fourth, pease. Fifth, barley. Sixth, oats: and then fallow. This rotation consists chiefly of robbing crops. Pease are the only leguminous crop, which even with the fallow is not sufficient to loosen a stiff soil. But the soil is good, which in some measure hides the badness of the rotation.—About Seaton, and all the way from Preston to Gosford, the ground is still more severely handled: wheat after fallow and dung, barley, oats, pease, wheat, barley, oats, and then another fallow. The soil is excellent; and it ought indeed to be so, to support many rounds of such cropping.

In the parishes of Tranent, Aberlady, Dirleton, North-Berwick, and Athelstonefoord, the following rotations were formerly universal, and to this day are much more frequent than any other mode.

1. After fallow with dung, wheat, barley, oats, pease and beans, barley, oats, wheat.

2. After fallow and dung, barley, oats, pease and beans, wheat, barley, oats, pease, wheat.

3. After fallow and dung, wheat oats, pease, barley, oats, wheat.

4. After fallow and dung, barley, oats, beans, wheat, pease, barley, oats.

In the several Tours of Young, the itinerant farmer, are found, in the best counties of England, examples without end, of rotations no less exceptionable than many of those mentioned.

189 Fields not to be kept too long in pasture.

Where a field is laid down for pasture in order to be recruited, it is commonly left in that state for many years; for it is the universal opinion, that the longer it lies, the richer it becomes for bearing corn. This may be true; but in order to determine the mode of cropping, the important point is, what upon the whole is the most profitable rotation; not what may produce luxuriant crops at a distant period. Upon that point, it may be affirmed, that the farmer who keeps a field in pasture beyond a certain time, loses every year considerably; and that a few luxuriant crops of corn, after 20 years of pasture, and still more after 30, will not make up the loss.

Pasture-grass, while young, maintains many animals; and the field is greatly recruited by what they drop; it is even recruited by hay crops, provided the grass be cut before feeding. But as old grass yields little profit, the field ought to be taken up for corn when the pasture begins to fail; and after a few crops, it ought to be laid down again with grass-seeds. Seduced by a chimerical notion, that a field, by frequent corn-crops, is fatigued and requires rest like a labouring man or animal, careful farmers give long rest to their fields by pasture, never adverting that it affords little profit. It ought to be their study, to improve their soil; by making it free, and also retentive of moisture. If they accomplish these ends, they need not be afraid of exhausting the soil by cropping.

190 Examples of rotations.

Where a farmer has access to no manure but what is his own production, the case under consideration, there are various rotations of crops, all of them good, though perhaps not equally so. We shall begin with two examples, one in clay, and one in free soil, each of the farms 90 acres. Six acres are to be inclosed for a kitchen-garden, in which there must be annually a crop of red clover, for summer-food to the working cattle. As there are annually 12 acres in hay, and 12 in pasture, a single plough with good cattle will be sufficient to command the remaining 60 acres.

Rotation in a clay soil.

Inclos.	1775.	1776.	1777.	1778.	1779.	1780.
1.	Fallow.	Wheat.	Pease.	Barley.	Hay.	Oats.
2.	Wheat.	Pease.	Barley.	Hay.	Oats.	Fallow.
3.	Pease.	Barley.	Hay.	Oats.	Fallow.	Wheat.
4.	Barley.	Hay.	Oats.	Fallow.	Wheat.	Pease.
5.	Hay.	Oats.	Fallow.	Wheat.	Pease.	Barley.
6.	Oats.	Fallow.	Wheat.	Pease.	Barley.	Hay.
7.	Pasture.	Pasture.	Pasture.	Pasture.	Pasture.	Pasture.

When the rotation is completed, the seventh inclosure having been six years in pasture, is ready to be taken up for a rotation of crops which begins with oats in the year 1781, and proceeds as in the sixth inclosure. In the same year 1781, the fifth inclosure is made pasture, for which it is prepared by sowing pasture grass seeds with the barley of the year 1780. And in this manner may the rotation be carried on without end. Here the labour is equally distributed; and there is no hurry nor confusion. But the chief property of this rotation is, that two culmiferous or white-corn crops are never found together: by a due mixture of crops, the soil is preserved in good heart without any adventitious manure. At the same time, the land is always producing plentiful crops: neither hay nor pasture get time to degenerate. The whole dung is laid upon the fallow.

Every farm that takes a grass-crop into the rotation must be inclosed, which is peculiarly necessary in a clay soil, as nothing is more hurtful to clay than poaching

Rotation in a free soil.

Inclos.	1775.	1776.	1777.	1778.	1779.	1780.
1.	Turnip.	Barley.	Hay.	Oats.	Fallow.	Wheat.
2.	Barley.	Hay.	Oats.	Fallow.	Wheat.	Turnip.
3.	Hay.	Oats.	Fallow.	Wheat.	Turnip.	Barley.
4.	Oats.	Fallow.	Wheat.	Turnip.	Barley.	Hay.
5.	Fallow.	Wheat.	Turnip.	Barley.	Hay.	Oats.
6.	Wheat.	Turnip.	Barley.	Hay.	Oats.	Fallow.
7.	Pasture.	Pasture.	Pasture.	Pasture.	Pasture.	Pasture.

For the next rotation, the seventh inclosure is taken up for corn, beginning with an oat crop, and proceeding in the order of the fourth inclosure; in place of which, the third inclosure is laid down for pasture by sowing pasture-grasses with the last crop in that inclosure, being barley. This rotation has all the advantages

ges of the former. Here the dung is employed on the turnip-crop.

We proceed to conſider what rotation is proper for carſe clay. The farm we propoſe conſiſts of 73 acres. Nine are to be incloſed for a kitchen garden, affording plenty of red clover to be cut green for the farm-cattle. The remaining 64 acres are divided into four incloſures, 16 acres each, to be cropped as in the following table.

Incloſ.	1775.	1776.	1777.	1778.
1.	Beans.	Barley.	Hay.	Oats.
2.	Barley.	Hay.	Oats.	Beans.
3.	Hay.	Oats.	Beans.	Barley.
4.	Oats.	Beans.	Barley.	Hay.

Here the dung ought to be applied to the barley.

Many other rotations may be contrived, keeping to the rules above laid down. Fallow, for example, wheat, peaſe and beans, barley, cabbage, oats, for clay. Here dung muſt be given both to the wheat and cabbage. For free ſoil, drilled turnip, barley, red clover, wheat upon a ſingle furrow, drilled potatoes, oats. Both the turnip and potatoes muſt have dung. Another for free ſoil: turnip drilled and dunged, red clover, wheat on a ſingle furrow with dung, peaſe, barley, potatoes, oats. The following rotation has proved ſucceſsful in a ſoil proper for wheat. 1. Oats with red clover, after fallow, without dung. 2. Hay. The clover-ſtubble dunged, and wheat ſown the end of October with a ſingle furrow. 3. Wheat. 4. Peaſe. 5. Barley. Fallow again. Oats are taken the firſt crop, to ſave the dung for the wheat. Oats always thrive on a fallow, though without dung, which is not the caſe of barley. But barley ſeldom fails after peaſe. In ſtrong clay ſoil, the following rotation anſwers. 1. Wheat after fallow and dung. 2. Beans ſown under furrow as early as poſſible. Above the beans, ſow peaſe end of March, half a boll per acre, and harrow them in. The two grains will ripen at the ſame time. 3. Oats or barley on a winter furrow with graſs-ſeeds. 4. Hay for one year or two; the ſecond growth paſtured. Lay what dung can be ſpared on the hay ſtubble, and ſow wheat with a ſingle furrow. 5. Wheat. 6. Beans or peaſe. 7. Oats. Fallow again.

Sect. VI. *Of Reaping Corn and Hay Crops, and Storing them up for uſe.*

191 Of ripeneſs.

Culmiferous plants are ripe when the ſtem is totally white: they are not fully ripe if any green ſtreaks remain. Some farmers are of opinion, that wheat ought to be cut before it is fully ripe. Their reaſons are, firſt, that ripe wheat is apt to ſhake; and next, that the flour is not ſo good. With reſpect to the laſt, it is contrary to nature, that any ſeed can be better in an unripe ſtate than when brought to perfection: nor will it be found ſo upon trial. With reſpect to the firſt, wheat, at the point of perfection, is not more apt to ſhake than for ſome days before: the huſk begins not to open till after the ſeed is fully ripe; and then the ſuffering the crop to ſtand becomes ticklish: after the minute of ripening, it ſhould be cut down in an inſtant, if poſſible.

192 Of reapers.

This leads to the hands that are commonly engaged to cut down corn. In Scotland, the univerſal practice was, to provide a number of hands, in proportion to the extent of the crop, without regard to the time of ripening. By this method, the reapers were often idle for want of work; and what is much worſe, they had often more work than they could overtake, and ripe fields were laid open to ſhaking winds. The Lothians have long enjoyed weekly markets for reapers, where a farmer can provide himſelf with the number he wants; and this practice is creeping into neighbouring ſhires. Where there is no opportunity of ſuch markets, neighbouring farmers ought to agree in borrowing and lending their reapers.

One ſhould imagine, that a caution againſt cutting corn when wet is unneceſſary; yet from the impatience of farmers to prevent ſhaking, no caveat is more ſo. Why do they not conſider, that corn ſtanding dries in half a day; when, in a cloſe ſheaf, the weather muſt be favourable if it dry in a month? in moiſt weather it will never dry.

193 Manner of cutting.

With reſpect to the manner of cutting, we muſt premiſe, that barley is of all the moſt difficult grain to be dried for keeping. Having no huſk, rain has eaſy acceſs; and it has a tendency to malten when wet. Where the ground is properly ſmoothed by rolling, it ſeems beſt to cut it down with the ſcythe. This manner being more expeditious than the ſickle, removes it ſooner from danger of wind; and gives a third more ſtraw, which is a capital article for dung, where a farm is at a diſtance from other manure. We except only corn that has lodged; for there the ſickle is more convenient than the ſcythe. As it ought to be dry when cut, bind it up directly: if allowed to lie any time in the ſwath, it is apt to be diſcoloured.—Barley ſown with graſs-ſeeds, red clover eſpecially, requires a different management. Where the graſs is cut along with it, the difficulty is great of getting it ſo dry as to be ventured in a ſtack. The beſt way is, to cut the barley with a ſickle above the clover, ſo as that nothing but clean barley is bound up. Cut with a ſcythe the ſtubble and graſs: they make excellent winter-food. The ſame method is applicable to oats; with this only difference, that when the field is expoſed to the ſouth-weſt wind, it is leſs neceſſary to bind immediately after mowing. As wheat commonly grows higher than any other grain, it is difficult to manage it with the ſcythe; for which reaſon the ſickle is preferred in England. Peaſe and beans grow ſo irregularly, as to make the ſickle neceſſary.

194 Drying of peaſe.

The beſt way for drying peaſe, is to keep ſeparate the handfuls that are cut: though in this way they wet eaſily, they dry as ſoon. In the common way of heaping peaſe together for compoſing a ſheaf, they wet as eaſily, and dry not near ſo ſoon. With reſpect to beans, the top of the handful laſt cut, ought to be laid on the bottom of the former; which gives ready acceſs to the wind. By this method peaſe and beans are ready for the ſtack in half the ordinary time.

195 Size of ſheaves.

A ſheaf commonly is made as large as can be contained in two lengths of the corn made into a rope. To ſave frequent tying, the binder preſſes it down with his knee, and binds it ſo hard as totally to exclude the air. If there be any moiſture in the crop, which ſeldom fails, a proceſs of fermentation and putrefaction commences in in the ſheaf; which is perfected in the ſtack, to the deſtruction both of corn and ſtraw. How ſtupid is it, to make the ſize of a ſheaf depend on the height of the plants! By that rule, a wheat-ſheaf is commonly ſo weighty, as to be unmanageable by ordinary arms: it requires an effort to move it, that frequently burſts the knot, and occaſions loſs of grain, beſide the trouble of a ſecond tying. Sheaves ought never to be larger than can be contained in one length of the plant, cut cloſe to the ground; without admitting any exception, if the plants be above eighteen inches high. The binder's arms then can compreſs the ſheaf ſufficiently, without need of his knee. The additional hands that this way of binding may require, are not to be regarded, compared with the advantage of drying ſoon. Corn thus managed may be ready for the ſtack in a week; it ſeldom in the ordinary way requires leſs than a fortnight, and frequently longer. Of a ſmall ſheaf compreſſed by the arm only, the air pervades every part; nor is it ſo apt to be looſed as a large ſheaf, however firmly bound. We omit the gathering of ſheaves into ſhocks, becauſe the common method is good, which is to place the ſhocks directed to the ſouth-weſt, in order to reſiſt the force of the wind. Five ſheaves on each ſide make a ſufficient ſtay; and a greater number cannot be covered with two head-ſheaves.

196
Carrying off the victual.

Every article is of importance that haſtens the operation in a country, ſubjected to unequal harveſt weather; for which reaſon, the moſt expeditious method ſhould be choſen for carrying corn from the field to the ſtack-yard. Our carriages are generally too ſmall or too large. A ſledge is a very aukward machine: many hands are required, and little progreſs made. Waggons and large carts are little leſs dilatory, as they muſt ſtand in the yard till unloaded ſheaf by ſheaf. The beſt way is, to uſe long carts moveable upon the axle, ſo as at once to throw the whole load on the ground; which is forked up to the ſtack by a hand appointed for that purpoſe. By this method, two carts will do the work of four or five.

197.
Stacking.

Building round ſtacks in the yard is undoubtedly preferable to houſing corn. There it is ſhut up from the air; and it muſt be exceedingly dry, if it contract not a muſtineſs, which is the firſt ſtep to putrefaction. Add to this, that in the yard, a ſtack is preſerved from rats and mice, being ſet on a pedeſtal; whereas no method has hitherto been invented for preſerving corn in a houſe from ſuch deſtructive vermin. The proper manner of building, is to make every ſheaf incline downward from its top to its bottom. Where the ſheaves are laid horizontally, the ſtack will take in rain both above and below. The beſt form of a ſtack is that of a cone placed on a cylinder; and the top of the cone ſhould be formed with three ſheaves drawn to a point. If the upper part of the cylinder be a little wider than the under, ſo much the better.

198
Covering the ſtacks.

The delaying to cover a ſtack for two or three weeks, though common, is, however, exceedingly abſurd; for if much rain fall in the interim, it is beyond the power of wind to dry the ſtack. Vegetation begun in the external parts, ſhuts out the air from the internal; and to prevent a total putrefaction, the ſtack muſt be thrown down, and expoſed to the air, every ſheaf. In order to have a ſtack covered the moment it is finiſhed, ſtraw and ropes ought to be ready; and the covering ought to be ſo thick as to be proof againſt rain.

Scotland is ſubject not only to floods of rain, but to high winds. Good covering guards againſt the former, and ropes artfully applied guard againſt the latter. The following is a good mode. Take a hay-rope well twiſted, and ſurround the ſtack with it, two feet or ſo below the top. Surround the ſtack with another ſuch rope immediately below the eaſing. Connect theſe two with ropes in an up-and-down poſition, diſtant from each other at the eaſing about five or ſix feet. Then ſurround the ſtack with other circular ropes parallel to the two firſt mentioned, giving them a twiſt round every one of theſe that lie up and down by which the whole will be connected together in a ſort of net-work. What remains is, to finiſh the two feet at the top of the ſtack. Let it be covered with bunches of ſtraw laid regularly up and down; the under part to be put under the circular rope firſt mentioned, which will keep it faſt, and the upper part be bound by a ſmall rope artfully twiſted, commonly called *the crown of the ſtack*. This method is preferable to the common way of laying long ropes over the top of the ſtack, and tying them to the belting-rope; which flattens the top, and makes it take in rain. A ſtack covered in the way here deſcribed, will ſtand two years ſecure both againſt wind and rain; a notable advantage in a variable climate.

The great aim in making hay is, to preſerve as much of the ſap as poſſible. All agree in this; and yet differ widely in the means of making that aim effectual. To deſcribe all the different means would be equally tedious and unprofitable. We ſhall confine ourſelves to two, which appear preferable to all others. A crop of rye-graſs and yellow clover ought to be ſpread as cut. A day or two after, when the dew is evaporated, rake it into a number of parallel rows along the field, termed *wind-rows*, for the convenience of putting it up into ſmall cocks. After turning the rows once and again, make ſmall cocks weighing a ſtone or two. At the diſtance of two days or ſo, put two cocks into one, obſerving always to mix the tops and bottoms together, and to take a new place for each cock, that the leaſt damage poſſible may be done to the graſs. Proceed in putting two cocks into one, till ſufficiently dry for tramp-ricks of 100 ſtone each. The eaſieſt way of erecting tramp-ricks, is to found a rick in the middle of the row of cocks that are to compoſe it. The cocks may be carried to the rick by two perſons joining arms together. When all the cocks are thus carried to the rick within the diſtance of 40 yards or ſo, the reſt of the cocks will be more expeditiouſly carried to the rick, by a rope wound about them and dragged by a horſe. Two ropes are ſufficient to ſecure the ricks from wind the ſhort time they are to ſtand in the field. In the year 1775, 10,000 ſtone were put into tramp-ricks the fourth day after cutting. In a country ſo wet as many parts of Scotland are, expedition is of mighty conſequence in the drying both of hay and corn. With reſpect to hay intended for horned cattle, it is by the generality held an improvement, that it be heated a little in the ſtack. But we violently ſuſpect this doctrine to have been invented for excuſing indolent management. An ox, it is true, will eat ſuch hay; but it will always be found that he prefers ſweet hay; and it

199
Hay making.

Practice.

it cannot well be doubted, but that such hay is the most salutary and the most nourishing.

200
Hay of red clover.

The making hay consisting chiefly of red-clover requires more care. The season of cutting is the last week of June, when it is in full bloom; earlier it may be cut, but never later. To cut it later would indeed produce a weightier crop; but a late first cutting makes the second also late, perhaps too late for drying. At the same time, the want of weight in an early first cutting, is amply compensated by the weight of the second.

When the season is too variable for making hay of the second growth, mix straw with that growth, which will be a substantial food for cattle during winter.—This is commonly done by laying strata of the straw and clover alternately in the stack. But by this method, the strata of clover, if they do not heat, turn mouldy at least, and unpalatable. The better way is, to mix them carefully with the hand before they be put into the stack. The dry straw imbibes moisture from the clover and prevents heating.

201
Other methods.
* *Essays on Agriculture*, vol. I. p. 186

But the best method of hay-making seems to be that recommended by Mr Anderson*. "Instead," says he, "of allowing the hay to lie, as usual in most places, for some days in the swathe after it is cut, and afterwards alternately putting it up into cocks and spreading it out, and tedding it in the sun, which tends greatly to bleach the hay, exhales its natural juices, and subjects it very much to the danger of getting rain, and thus runs a great risk of being good for little, I make it a general rule, if possible, never to cut hay but when the grass is quite dry; and then make the gatherers follow close upon the cutters,—putting it up immediately into small cocks about three feet high each when new put up, and of as small a diameter as they can be made to stand with; always giving each of them a slight kind of thatching, by drawing a few handfuls of the hay from the bottom of the cock all around, and laying it lightly upon the top with one of the ends hanging downwards. This is done with the utmost ease and expedition; and when it is once in that state, I consider my hay as in a great measure out of danger: for unless a violent wind should arise immediately after the cocks are put up, so as to overturn them, nothing else can hurt the hay; as I have often experienced that no rain, however violent, ever penetrates into these cocks but for a very little way. And, if they are dry put up, they never sit together so closely as to heat; although they acquire, in a day or two, such a degree of firmness, as to be in no danger of being overturned by wind after that time, unless it blows a hurricane.

"In these cocks I allow the hay to remain, until, upon inspection, I judge that it will keep in pretty large tramp-cocks (which is usually in one or two weeks, according as the weather is more or less favourable, when two men, each with a long pronged pitch-fork, lift up one of these small cocks between them with the greatest ease, and carry them one after another to the place where the tramp-cock is to be built (A): and in this manner they proceed over the field till the whole is finished.

202
Advantages of this method.

"The advantages that attend this method of making hay, are, That it greatly abridges the labour, as it does not require above the one-half of the work that is necessary in the old method of turning and tedding it: That it allows the hay to continue almost as green as when it is cut, and preserves its natural juices in the greatest perfection; for, unless it be the little that is exposed to the sun and air upon the surface of the cocks, which is no more bleached than every straw of hay saved in the ordinary way, the whole is dried in the most slow and equal manner that could be desired: and, lastly, That it is thus in a great measure secured from almost the possibility of being damaged by rain.' This last circumstance deserves to be much more attended to by the farmer than it usually is at present; as I have seen few who are sufficiently aware of the loss that the quality of their hay sustains by receiving a slight shower after it is cut, and before it is gathered; the generality of farmers seeming to be very well satisfied if they get in their hay without being absolutely rotted; never paying the least attention to its having been several times wetted while the hay was making. But, if these gentlemen will take the trouble at any time to compare any parcel of hay that has been made perfectly dry, with another parcel from the same field that has received a shower while in the swathe, or even a copious dew, they will soon be sensible of a very manifest difference between them; nor will their horses or cattle ever commit a mistake in choosing between the two.

203
Particular caution requisite in this method.

"Let it be particularly remarked, that in this manner of making hay, great care must be taken that it be dry when first put into the cocks; for, if it is in the least degree wet at that time, it will turn instantly mouldy, and sit together so as to become totally impervious to the air, and will never afterwards become dry till it is spread out to the sun. For this reason, if at any time during a course of good settled weather you should begin to cut in the morning before the dew is off the grass, keep back the gatherers till the dew is evaporated; allowing that which was first cut to lie till it is dry before it is cocked. In this case, you will almost always find that the uncut grass will dry sooner than that which has been cut when wet; and, therefore, the gatherers may always begin to put up that which is fresh cut before the other; which will usually require two or three hours to dry after the new-cut hay may be cocked. And if, at any time, in case of necessity, you should be obliged to cut your hay before it is dry, the same rule must be observed, always to allow it to remain in the swathe till it is quite dry: but, as there is always a great risk of being long in getting it up

(A) If the hay is to be carried to any considerable distance, this part of the labour may be greatly abridged, by causing the carriers take two long sticks of a sufficient strength, and having laid them down by the small cocks parallel to one another, at the distance of one and a half, or two feet asunder, let them lift three or four cocks, one after another, and place them carefully above the sticks, and then carry them altogether, as if upon a hand-barrow, to the place where the large rick is to be built.

Practice. up, and as it never in this case *wins* (A) so kindly as if it had been dry cut, the farmer ought to endeavour, if possible, in all cases, to cut his hay only when dry; even if it should cost him some additional expence to the cutters, by keeping them employed at any other work, or even allowing them to remain idle, if the weather should be variable or rainy.

"But if there is a great proportion of clover, and the weather should chance to be close and calm at the time, it may, on some occasions, be necessary to open up these cocks a little, to admit some fresh air into them; in which case, after they have stood a day or two, it may be of great use to turn these cocks and open them up a little, which ought to be done in the driest time of the day; the operator taking that part of each cock which was the top, and with it forming the base of a new one; so that the part which was most exposed to the air becomes excluded from it, and that which was undermost comes to be placed upon the top, so as to make it all dry as equally as possible.

"If the hay has not been damp when it was first put up, the cock may be immediately finished out at once; but if it is at all wet, it will be of great use to turn over only a little of the top of the cock at first, and leaving it in that state to dry a little, proceed to another, and a third, and fourth, &c. treating each in the same way; going on in that manner till you find that the inside of the first opened cock is sufficiently dried, when it will be proper to return to it, turning over a little more of it till you come to what is still damp, when you leave it and proceed to another, and so on round the whole; always returning afresh till the cocks are entirely finished. This is the best way of saving your hay, if you have been under the necessity of cutting it while damp; but it is always best to guard against this inconvenience, if possible."

204 Hay stacks. In the yard, a stack of hay ought to be an oblong square, if the quantity be greater than to be easily stowed in a round stack; because a smaller surface is exposed to the air, than in a number of round stacks. For the same reason, a stack of pease ought to have the same form, the straw being more valuable than that of oats, wheat, or barley. The moment a stack is finished, it ought to be covered; because the surface-hay is much damaged by withering in dry weather, and moistening in wet weather. Let it have a pavilion-roof; for more of it can be covered with straw in that shape, than when built perpendicular at the ends. Let it be roped as directed above for corn-stacks; with this difference only, that in an oblong square the ropes must be thrown over the top, and tied to the belt-rope below. This belt-rope ought to be fixed with pins to the stack: the reason is, that the ropes thrown over the stack will bag by the sinking of the stack, and may be drawn tight by lowering the belt-rope, and fixing it in its new position with the same pins.

The stems of hops, being long and tough, make excellent ropes; and it will be a saving article, to propagate a few plants of that kind for that very end.

A stack of rye-grass hay, a year old, and of a moderate size, will weigh, each cubic yard, 11 Dutch stone. A stack of clover-hay in the same circumstances weighs somewhat less. Practice.

Sect. VII. *Manures.*

The manures commonly used are dung, lime, shell-marl, clay-marl, and stone-marl. Many other substances are used; shavings of horn, for example, refuse of malt, and even old rags: but as the quantity that can be procured is inconsiderable, and as their application is simple, we shall consume no time upon them.

Dung is the chief of all manures; because a quantity of it may be collected in every farm, and because it makes the quickest return. A field sufficiently dunged will produce good crops four or five years.

Dung of animals that chew the cud, being more thoroughly putrefied than that of others, is fit to be mixed with the soil without needing to be collected into a dunghill. A horse does not chew the cud; and in horse-dung may be perceived straw or rye-grass broken into small parts, but not dissolved: it is proper therefore that the putrefaction be completed in a dunghill. It ought to be mixed there with cool materials: so hot it is, that, in a dunghill by itself, it singes and burns instead of putrefying. The difference between the dung of a horse and of a horned animal, is visible in a pasture-field: the grass round the former is withered; round the latter, it is ranker and more verdant than in the rest of the field. A mixture of dry and moist stuff ought to be studied: the former attracting moisture from the latter, they become equally moist. 205 Dung.

To prevent sap from running out of a dunghill, its situation should be a little below the surface; and to prevent rain from running into it, it should be surrounded with a ring of sod. If the soil on which the dunghill stands be porous, let it be paved, to prevent the sap from sinking into the ground. If moisture happen to superabound, it may be led off by a small gutter to impregnate a quantity of rich mould laid down to receive it, which will make it equal to good dung. 206 Of a dunghill.

Straw should be prepared for the dunghill, by being laid under cattle, and sufficiently moistened. When laid dry into a dunghill, it keeps it open, and admits too much air, and prevents putrefaction.

Dung from the stable ought to be carefully spread on the dunghill, and mixed with the former dung. When left in heaps upon the dunghill, fermentation and putrefaction go on unequally.

Complete putrefaction is of importance with regard to the seed of weeds that are in the dunghill: if they remain sound, they are carried out with the dung, and infest the ground. Complete putrefaction is of still greater importance by pulverizing the dung; in which condition it mixes intimately with the soil, and operates the most powerfully. In land intended for barley, undigested dung has a very bad effect: it keeps the ground open, admits drought, and prevents the seed from springing. On the other hand, when thoroughly rotted, it mixes with the soil, and enables it to retain moisture. It follows, that the properest time for dunging a field, is

(A) By *winning* hay, is meant the operation by which it is brought from the succulent state of grass to that of a dry fodder.

Practice. is in its higheſt pulverization; at which time the earth mixes intimately with the dung. Immediately before
207 Time for dunging. ſetting cabbage, ſowing turnip, or wheat, is a good time. Dung divides and ſpreads the moſt accurately when moiſt. Its intimate mixture with the ſoil is of ſuch importance, that hands ſhould be employed to di-
208 vide and ſpread any lumps that may be in it.

Manner of dunging. Dung ſhould be ſpread, and ploughed into the ground without delay. When a heap lies two or three weeks, ſome of the moiſture is imbibed into the ground, which will produce tufts of corn more vigorous than in the reſt of the field. There cannot be a worſe practice than to lead out dung before winter, leaving it expoſed to froſt and ſnow. The whole ſpirit of the dung is extracted by rain, and carried off with it. The dung diveſted of its ſap becomes dry in ſpring, and incapable of being mixed with the mould. It is turned over
209 whole by the plough, and buried in the furrow.

Of collecting dung. As dung is an article of the utmoſt importance in huſbandry, one ſhould imagine, that the collecting it would be a capital article with an induſtrious farmer. Yet an ingenious writer, obſerving that the Jamaicans are in this particular much more induſtrious than the Britiſh, aſcribes the difference to the difficulty of procuring dung in Jamaica. "In England, where the long winter enables a farmer to raiſe what quantity he pleaſes, it is not collected with any degree of induſtry. But in Jamaica, where there is no winter, and where the heat of the ſun is a great obſtruction, the farmer muſt be indefatigable, or he will never raiſe any dung." Cool intereſt is not alone a ſufficient motive with the indolent, to be active. As dung is of great importance in huſbandry, a farmer cannot be too aſſiduous in collecting animal and vegetable ſubſtances that will rot. One article of that kind there is, to collect which there is a double motive, and yet is neglected almoſt every where. A farm full of weeds is a nuiſance to the neighbourhood: it poiſons the fields around; and the poſſeſſor ought to be diſgraced as a peſt to ſociety. Now the cutting down every weed before the ſeed is formed, anſwers two excellent purpoſes. Firſt, it encourages good crops, by keeping the ground clean. Next, theſe weeds mixed with other materials in a dunghill, may add conſiderably to the quantity of
210 dung.

Of lime. Next of lime, which is a profitable manure, and greatly ſo when it can be got in plenty within a moderate diſtance. The benefit of lime is ſo viſible, that the uſe of it has become general, where the price and car-
211 riage are in any degree moderate.

Its operation. However people may differ in other particulars, all agree, that the operation of lime depends on its intimate mixture with the ſoil; and therefore that the proper time of applying it, is when it is perfectly powdered and the ſoil at the ſame time in the higheſt degree of pulverization. Lime of itſelf is abſolutely barren: and yet it enriches a barren ſoil. Neither of the two produces any good effect without the other: and conſequently, the more intimately they are mixed, the effect muſt be the greater.

Hence it follows, that lime ought always to be ſlaked with a proper quantity of water, becauſe by that means it is reduced the moſt effectually into powder. Lime left to be ſlaked by a moiſt air, or accidental rain, is ſeldom or never thoroughly reduced into powder; and therefore can never be intimately mixed with the ſoil. Sometimes an opportunity offers to bring home ſhell-lime before the ground is ready for it; and it is commonly thrown into a heap without cover, truſting to rain for ſlaking. The proper way is, to lay the ſhell-lime in different heaps on the ground where it is to be ſpread, to reduce theſe heaps into powder by ſlaking it with water, and to cover the ſlaked lime with ſod ſo as to defend it from rain. One however ſhould avoid as much as poſſible the bringing home lime before the ground be ready for it. Where allowed to lie long in a heap, there are two bad conſequences: firſt, lime attracts moiſture, even though well covered, and runs into clots, which prevents an intimate mixture; and, next, we know, that burnt limeſtone, whether in ſhells or in powder, returns gradually into its original ſtate of limeſtone; and upon that account alſo, is leſs capable of being mixed with the ſoil. And this is verified by a fact, that, after lying long, it is ſo hard bound together as to require a pick to ſeparate the parts.

For the ſame reaſon, it is a bad practice, though common, to let ſpread lime lie on the ſurface all winter. The bad effects abovementioned take place here in part: and there is another; that rain waſhes the lime down to the furrows, and in a hanging field carries the whole away. 212

As the particles of powdered lime are both ſmall and Time of liming. heavy, they quickly ſink to the bottom of the furrow, if care be not taken to prevent it. In that view, it is a rule, that lime be ſpread, and mixed with the ſoil, immediately before ſowing, or along with the ſeed. In this manner of application, there being no occaſion to move it till the ground be ſtirred for a new crop, it has time to incorporate with the ſoil, and does not readily ſeparate from it. Thus, if turnip-ſeed is to be ſown broadcaſt, the lime ought to be laid on immediately before ſowing, and harrowed in with the ſeed. If a crop of drilled turnip or cabbage be intended, the lime ought to be ſpread immediately before forming in drills. With reſpect to wheat, the lime ought to be ſpread immediately before ſeed-furrowing. If ſpread more early, before the ground be ſufficiently broken, it ſinks to the bottom. If a light ſoil be prepared for barley, the lime ought to be ſpread after ſeed-furrowing, and harrowed in with the ſeed. In a ſtrong ſoil, it ſinks not ſo readily to the bottom; and therefore, before ſowing the barley, the lime ought to be mixed with the ſoil by a brake. Where moor is ſummer-fallowed for a crop of oats next year, the lime ought to be laid on immediately before the laſt ploughing, and braked in as before. It has ſufficient time to incorporate with the ſoil before the land be ſtirred again. 213

The quantity to be laid on depends on the nature Quantity, of the ſoil. Upon a ſtrong ſoil, 70 or 80 bolls of ſhells are not more than ſufficient, reckoning four ſmall firlots to the boll, termed *wheat-meaſure*; nor will it be an overdoſe to lay on 100 bolls. Between 50 and 60 may ſuffice upon medium ſoils; and upon the thin or gravelly, between 30 and 40. It is not ſafe to lay a much greater quantity on ſuch ſoils. 214

It is common to lime a paſture-field immediately Liming paſture-fields. before ploughing. This is an unſafe practice; it is thrown to the bottom of the furrow, from which it is never fully gathered up. The proper time for liming

Practice.

a pasture field, intended to be taken up for corn, is a year at least, or two, before ploughing. It is washed in by rain among the roots of plants, and has time to incorporate with the soil.

215 Beat limestone.

Limestone beat small makes an excellent manure; and supplies the want of powdered lime where there is no fuel to burn the limestone. Limestone beat small has not hitherto been much used as a manure; and the proportion between it and powdered lime has not been ascertained. What follows may give some light. Three pounds of raw lime is by burning reduced to two pounds of shell-lime. Yet nothing is expelled by the fire but the air that was in the limestone: the calcareous earth remains entire. *Ergo*, two pounds of shell-lime contain as much calcareous earth as three pounds of raw limestone. Shell-lime of the best quality, when slaked with water, will measure out to thrice the quantity. But as limestone loses none of its bulk by being burnt into shells, it follows, that three bushels of raw limestone contain as much calcareous earth as six bushels of powdered lime; and consequently, if powdered lime possess not some virtue above raw limestone, three bushels of the latter beat small should equal as a manure six bushels of the former.

216 Of shell-marl.

Shell-marl, as a manure, is managed in every respect like powdered lime; with this only difference, that a fifth or a fourth part more in measure ought to be given. The reason is, that shell-marl is less weighty than lime; and that a boll of it contains less calcareous earth, which is the fructifying part of both.

Clay and stone marls, with respect to husbandry, are the same, though in appearance different.

217 Of clay and stone-marls.

The goodness of marl depends on the quantity of calcareous earth in it: which has been known to amount to a half or more. It is too expensive if the quantity be less than a third or a fourth part. Good marl is the most substantial of all manures; because it improves the weakest ground to equal the best borough-acres. The low part of Berwickshire termed *the Merse*, abounds every where with this marl; and is the only county in Scotland where it is plenty.

Land ought to be cleared of weeds before marling; and it ought to be smoothed with the brake and harrow, in order that the marl may be equally spread. Marl is a fossil on which no vegetable will grow; its efficacy depends, like that of lime, on its pulverization, and intimate mixture with the soil. Toward the former, alternate drought and moisture contribute greatly, as also frost. Therefore, after being evenly spread, it ought to lie on the surface all winter. In the month of October it may be roused with a brake; which will bring to the surface, and expose to the air and frost, all the hard parts, and mix with the soil all that is powdered. In that respect it differs widely from dung and lime, which ought to be ploughed into the ground without delay. Oats is a hardy grain, which will answer for being the first crop after marling better than any other; and it will succeed though the marl be not thoroughly mixed with the soil. In that case, the marl ought to be ploughed in with an ebb furrow immediately before sowing, and braked thoroughly. It is ticklish to make wheat the first crop: if sown before winter, frost swells the marl, and is apt to throw the seed out of the ground; if sown in spring, it will suffer more than oats by want of due mixture.

Practice.

Summer is the proper season for marling; because in that season the marl, being dry, is not only lighter, but is easily reduced to powder. Frost however is not improper for marling, especially as in frost there is little opportunity for any other work.

Marl is a heavy body, and sinks to the bottom of the furrow, if indiscreetly ploughed. Therefore the first crop should always have an ebb furrow. During the growing of that crop, the marl has time to incorporate with the soil, and to become a part of it; after which it does not readily separate.

Sect. VIII. *Principles and Operations of the New or Horse-hoeing Husbandry.*

The general properties attributed to the new husbandry may be reduced to two, viz. the promoting the growth of plants by hoeing, and the saving of seed; both of which are equally profitable to the farmer. 218

Advantages ascribed to horse-hoeing.

The advantages of tillage before sowing have already been pointed out. In this place we must confine ourselves to the utility of tillage after sowing. This kind of tillage is most generally known by the name of *horse-hoeing*.

Land sowed with wheat, however well it may be cultivated in autumn, sinks in the winter; the particles get nearer together, and the weeds rise; so that in spring, the land is nearly in the same situation as if it never had been ploughed. This, however, is the season when it should branch and grow with most vigour; and consequently stands most in need of ploughing or hoeing, to destroy the weeds, to supply the roots with fresh earth, and, by dividing anew the particles of the soil, to allow the roots to extend and collect nourishment.

It is well known, that, in gardens, plants grow with double vigour after being hoed or transplanted. If plants growing in arable land could be managed with ease and safety in this manner, it is natural to expect, that their growth would be promoted accordingly. Experience shows, that this is not only practicable, but attended with many advantages.

In the operation of hoeing wheat, though some of the roots be moved or broken, the plants receive no injury, for this very circumstance makes them send forth a greater number of roots than formerly, which enlarge their pasture, and consequently augment their growth.

Sickly wheat has often recovered its vigour after a good hoeing, especially when performed in weather not very hot or dry.

Wheat, and such grain as is sown before winter, requires hoeing more than oats, barley, or other grain sown in the spring; for, if the land has been well ploughed before the sowing of spring-corn, it neither has time to harden, nor to produce many weeds, not having been exposed to the winter's snow and rain.

Of Sowing.

As, in the practice of the New Husbandry, plants grow with greater vigour than by the old method, the land should be sowed thinner. It is this principle of the new husbandry that has been chiefly objected to; for, upon observing the land occupied by a small number of plants, people are apt to look upon all the vacant 219

Method of sowing in the New Husbandry

Practice.

cant space as lost. But this prejudice will soon be removed, when it is considered, that, in the best land cultivated in the common method, and sown very thick, each seed produced but one or two ears; that, in the same land sown thinner, every seed produced two or three ears; and that a single seed sometimes produces 18 or 21 ears.

In the common method, as there are many more plants than can find sufficient nourishment, and as it is impossible to assist them by hoeing, numbers die before they attain maturity, the greatest part remain sickly and drooping; and thus part of the seed is lost. On the contrary, in the new method, all the plants have as much food as they require; and as they are, from time to time, assisted by hoeing, they become so vigorous as to equal in their production the numerous but sickly plants cultivated in the common method.

Of Hoeing.

The new husbandry is absolutely impracticable in lands that are not easily ploughed. Attempting to cultivate land according to this husbandry, without attending to this circumstance, that it is practicable in no land except in such as have already been brought into good tilth by the old method, has gone far to make it contemptible in many places.

220 The different hoeings.

When a field is in good tilth, it should be sown so thin as to leave sufficient room for the plants to extend their roots. After being well ploughed and harrowed, it must be divided into rows, at the distance of thirty inches from one another. On the sides of each of these rows, two rows of wheat must be sowed six inches distant from each other. By this means there will be an interval of two feet wide betwixt the rows, and every plant will have room enough to extend its roots, and to supply it with food. The intervals will likewise be sufficient for allowing the earth to be hoed or tilled without injuring the plants in the rows.

The first hoeing, which should be given before the winter, is intended to drain away the wet, and to dispose the earth to be mellowed by the frosts. These two ends will be answered by drawing two small furrows at a little distance from the rows, and throwing the earth taken from the furrows into the middle of the intervals. This first hoeing should be given when the wheat is in leaf.

The second hoeing, which is intended to make the plants branch, should be given after the hard frosts are over. To do this with advantage, after stirring the earth a little near the rows, the earth which was thrown in the middle of the intervals should be turned back into the furrows. This earth, having been mellowed by the winter, supplies the plants with excellent food, and makes the roots extend.

The third hoeing, which is intended to invigorate the stalk, should be given when the ears of the corn begin to show themselves. This hoeing may, however, be very slight.

But the last hoeing is of the greatest importance, as it enlarges the grain, and make the ears fill at their extremities. This hoeing should be given when the wheat is in bloom; a furrow must be drawn in the middle of the interval, and the earth thrown to the right and left on the root of the plants. This supports the plants, prevents them from being laid, and prepares the ground for the next sowing, as the seed is then to be put in the middle of the ground that formed the intervals.

The best season for hoeing is two or three days after rain, or so soon after rain as the soil will quit the instrument in hoeing. Light dry soils may be hoed almost any time, but this is far from being the case with strong clay soils: the season for hoeing such is frequently short and precarious; every opportunity therefore should be carefully watched, and eagerly embraced. The two extremes of wet and dry, are great enemies to vegetation in strong clay soils. There is a period between the time of clay soils running together, so as to puddle by superfluous wet, and the time of their caking by drought, that they are as tractable as need be. This is the juncture for hoeing; and so much land as shall be thus seasonably hoed, will not cake or crust upon the surface, as it otherwise would have done, till it has been soaked or drenched again with rain; in which case the hoeing is to be repeated as soon as the soil will quit the instrument, and as often as necessary; by which time the growing crop will begin to cover the ground, so as to act as a screen to the surface of the land against the intense heat of the sun, and thereby prevent, in great measure, the bad effects of the soil's caking in dry weather.

By this successive tillage, or hoeing, good crops will be obtained, provided the weather is not very unfavourable.

But as strong, vigorous plants are longer before they arrive at maturity, corn raised in the new way is later in ripening than any other, and must therefore be sown earlier.

In order to prepare the intervals for sowing again, some well-rotted dung may be laid in the deep furrows made in the middle of the intervals; and this dung must be covered with the earth that was before thrown towards the rows of wheat. But, if the land does not require mending, the deep furrow is filled without any dung. This operation should be performed immediately after the harvest, that there may be time to give the land a slight stirring before the rows are sowed; which should occupy the middle of the space which formed the intervals during the last crop. The intervals of the second year take up the space occupied by the stubble of the first.

Supposing dung to be necessary, which is denied by many, a very small quantity is sufficient; a single layer, put in the bottom of each furrow, will be enough.

Description of the Instruments commonly used in the New Husbandry.

221 Instrument described. Plate VII.

Fig. 1. is a marking plough. The principal use of this plough is to straight and regulate the ridges. The first line is traced by the eye, by means of three poles, placed in a straight line. The plough draws the first furrow in the direction of this line; and at the same time, with the tooth A, fixed in the block of wood near the end of the cross-pole or slider B B, marks the breadth of the ridge at the distance intended. The ploughman next traces the second line or rutt made by the tooth, and draws a small furrow along it; and continues in this manner till the whole field is laid out in straight and equidistant ridges.

Fig.

Practice.

Fig. 2. is a plough for breaking up lea, or turning up the bottom of land when greatly exhausted. By its construction, the width and depth of the furrows can be regulated to a greater certainty than by any other hitherto known in this country. Its appearance is heavy; but two horses are sufficient to plough with it in ordinary free land; and only four are necessary in the stiffest clay-soils. This plough is likewise easily held and tempered. A, is the sword fixed in the sizers B, which runs through a mortoise E, at the end of the beam C, and regulates the depth of the furrow by raising or depressing the beam; it is fixed by putting the pin D thro' the beam and sword, and is moveable at E.

Plate VIII.

Fig. 3. is a jointed brake-harrow with 24 teeth, shaped like coulters, and standing at about an angle of 80 degrees. By this instrument the land is finely pulverized, and prepared for receiving the seed from the drill. It requires four horses in stiff, and two in open, land. This harrow is likewise used for levelling the ridges; which is done by pressing it down by the handles where the ridge is high, and raising it up when low.

Fig. 4. is an angular weeding harrow, which may follow the brake when necessary. The seven hindmost teeth should stand at a more acute angle than the rest, in order to collect the weeds, which the holder can drop at pleasure, by raising the hinder part, which is fixed to the body of the harrow by two joints.

Fig. 5. is a pair of harrows with shafts. This harrow is used for covering the seed in the drills, the horse going in the furrow.

Fig. 6. is a drill-plough, constructed in such a manner as to sow at once two rows of beans, pease, or wheat. This machine is easily wrought by two horses. A, is the hopper for containing the seed; B, circular boxes for receiving the seed from the hopper; CC, two square boxes which receive the seed from small holes in the circular boxes, as they turn round; and last of all, the seed is dropped into the drills through holes in the square boxes, behind the coulters D. The cylinder E follows, which, together with the wheel F, regulates the depth of the coulters, and covers the seed; the harrow G comes behind all, and covers the seed more completely. HH, two sliders, which, when drawn out, prevent the seed from falling into the boxes; and, I, is a catch which holds the rungs, and prevents the boxes from turning, and losing seed at the ends of the ridges.

Fig. 7. is a single hoe-plough of a very simple construction, by which the earth in the intervals is stirred and laid up on both sides to the roots of the plants, and at the same time the weeds are destroyed. AA the mould-boards, which may be raised or depressed at pleasure, according as the farmer wants to throw the earth higher or lower upon the roots.

Plate VII.

Fig. 2. is a drill-rake for pease. This instrument, which is chiefly calculated for small inclosures of light grounds, is a sort of strong plough rake, with four large teeth at *a*, *a*, *b*, *b*, a little incurvated. The distance from *a* to *a*, and from *b* to *b*, is nine inches. The interval between the two inner teeth, *a* and *b*, is three feet six inches, which allows sufficient room for the hole-plough to move in. To the piece of timber *cc*, forming the head of the rake, are fixed the handles *d*, and the beam *e*, to which the horse is fastened. When this instrument is drawn over a piece of land made thoroughly fine, and the man who holds it bears upon the handles, four furrows, *f*, *g*, *h*, *i*, will be formed, at the distance determined by the construction of the instrument. These distances may be accurately preserved, provided that the teeth *a a* return when the ploughman comes back, after having ploughed one turn, in two of the channels formed before, marked *b b*: thus all the furrows in the field will be traced with the same regularity. When the ground is thus formed into drills, the pease may be scattered by a single motion of the hand at a certain distance from one another into the channels, and then covered with the flat part of a hand-rake, and pressed down gently. This instrument is so simple, that any workman may easily make or repair it.

On Plate IX. is delineated a patent drill machine, lately invented by the Reverend James Cooke of Heaton-Norris near Manchester. A, the upper part of the seed-box. B, the lower part of the same box. C, a movable partition, with a lever, by which the grain or seed is let fall at pleasure from the upper to the lower part of the seed-box, from whence it is taken up by cups or ladles applied to the cylinder D, and dropped into the funnel E, and conveyed thereby into the furrow or drill made in the land by the coulter F, and covered by the rake or harrow G. H, a lever, by which the wheel I is lifted out of generation with the wheel K, to prevent the grain or seed being scattered upon the ground, while the machine is turning round at the end of the land, by which the harrow G is also lifted from the ground at the same time, and by the same motion, by means of the crank, and the horizontal lever *h h*. L, a sliding lever, with a weight upon it, by means of which, the depth of the furrows or drills, and consequently the depth that the grain or seed will be deposited in the land, may be easily ascertained. M, a screw in the coulter beam, by turning of which, the seed-box B is elevated or depressed, in order to prevent the grain or seed being crushed or bruised by the revolution of the cups or ladles. Fig. 13. a rake with iron teeth, to be applied to the under side of the rails of the machine, with staples and screw nuts at *n n*, by which many useful purposes are answered, viz. in accumulating cuitch or hay into rows, and as a scarificator for young crops of wheat in the spring, or to be used upon a fallow; in which case, the seed-box, the ladle cylinder, the coulters, the funnels, and harrows, are all taken away.

This side view of the machine is represented, for the sake of perspicuity, with one seed-box only, one coulter, one funnel, one harrow, &c. whereas a complete machine is furnished with five coulters, five harrows, seven funnels, a seed-box in eight partitions, &c. with ladles of different sizes, for different sorts of grain and seeds.

These machines, (with five coulters sixteen guineas, with four coulters fifteen guineas) equally excel in setting or planting all sorts of grain and seeds, even carrot seed, to exactness, after the rate of from eight to ten chain acres per day, with one man, a boy, and two horses. They deposite the grain or seed in any given quantity from one peck to three bushels per acre, regularly and uniformly, and that without grinding or bruising the seed, and at any given depth, from half an inch to half a dozen inches, in rows at the distance of twelve,

twelve, sixteen and twenty-four inches, or any other distance. They are equally useful on all lands, are durable, easy to manage, and by no means subject to be put out of repair.

The ladle cylinder D is furnished with cups or ladles of four different sizes for different sorts of grain or seeds, which may be distinguished by the numbers 1, 2, 3, 4.—N° 1. (the smallest size) is calculated for turnip-seed, clover-seed, cole-seed, rape, &c. and will sow something more than one pound per statute acre. N° 2. for wheat, rye, hemp, flax, &c. and will sow something more than one bushel per acre. N°. 3 for barley: and will sow one bushel and a half per acre. N° 4. for beans, oats, pease, vetches, &c. and will sow two bushels per acre.

Notwithstanding the above specified quantities of grain or seeds, a greater or less quantity of each may be sown at pleasure, by stopping up with a little clay, or by adding a few ladles to each respective box. The grain or seeds intended to be sown, must be put in those boxes, to which the cups or ladles as above described respectively belong, an equal quantity into each box, and all the other boxes empty. The ladle cylinder may be reversed, or turned end for end at pleasure, for different sorts of grain, &c.

For sowing beans, oats, pease, &c. with a five coulter machine, four large ladles must occasionally be applied at equal distances round those parts of the cylinder which subtend the two end boxes. And for sowing barley, eight large ones must be applied as above; or four ladles, N° 2. to each of the wheat-boxes. These additional ladles are fixed on the cylinder with nails, or taken off in a few minutes; but for sowing with a four-coulter machine, the above alterations are not necessary.

The funnels are applied to their respective places by corresponding numbers. Care should be taken, that the points of the funnel stand directly behind the backs of the coulters, which is done by wedges being applied to one side or other of the coulters, at the time they are fixed in their respective places.

The machine being thus put together, which is readily and expeditiously done, as no separate part will coincide with any other but that to which it respectively belongs, and an equal quantity of grain or seed in each of the respective boxes, the land also being previously ploughed and harrowed once or so in a place to level the surface; but if the land be very rough, a roller will best answer that purpose, whenever the land is dry enough to admit of it; and upon strong clays, a spiked roller is sometimes necessary to reduce the size of large dry clods; which being done, the driver should walk down the furrow or edge of the land, and having hold of the last horse's head with his hand, he will readily keep him in such a direction, as will bring the outside coulter of the machine within three or four inches of the edges of the land or ridge, at which uniform extent, he should keep his arm until he comes to the end of the land; where having turned round, he must come to the other side of his horses, and walking upon the last outside drill, having hold of the horse's head with his hand as before, he will readily keep the machine in such a direction, as will strike the succeeding drill at such a distance from the last outside one, or that he walks upon, as the coulters are distant from each other.

The person who attends the machine should put down the lever H soon enough at the end of the land, that the cups or ladles may have time to fill, before he begins to sow; and at the end of the land, he must apply his right hand to the middle of the rail between the handles, by which he will keep the coulters in the ground, while he is lifting up the lever H with his left hand, to prevent the grain being scattered upon the headland, while the machine is turning round; this he will do with great ease, by continuing his right hand upon the rail between the handles, and applying his left arm to the left handle, in order to lift the coulters out of the ground while the machine is turning round.

If there be any difficulty in using the machine, it consists in driving it straight. As to the person who attends the machine, he cannot possibly commit any errors, except such as are wilful, particularly as he sees at one view the whole process of the business, viz. that the coulters make the drills of a proper depth; that the funnels continue open to convey the grain or seed into the drills; that the rakes or harrows cover the grain sufficiently; and when seed is wanting in the lower boxes B, which he cannot avoid seeing, he readily supplies them from the upper boxes A, by applying his hand, as the machine goes along, to the lever C. The lower boxes B, should not be suffered to become empty before they are supplied with seed, but should be kept nearly full, or within an inch or so of the edge of the box.

If chalk lines are made across the backs of the coulters, at such a distance from the ends as the seed should be deposited in the ground (viz. about two inches for wheat, and from two to three for spring corn), the person that attends the machine will be better able to ascertain the depth the seed should be deposited in the drills, by observing, as the machine goes along, whether the chalk-lines are above or below the surface of the land; if above a proper weight must be applied to the lever L, which will force the coulters into the ground; if below, the lever L and weight must be reversed, which will prevent their sinking too deep.

In different parts of the kingdom, lands or ridges are of different sizes: where the machine is too wide for the land, one or more funnels may occasionally be stopped with a little loose paper, and the seed received into such funnel returned at the end of the land, or sooner if required, into the upper seed-box. But for regularity and expedition, lands consisting of so many feet wide from outside to outside, as the machine contains coulters, when fixed at twelve inches distance, or twice or three times the number, &c. are best calculated for the machine. In wet soils or strong clays, lands or ridges of the width of the machine, and in dry soils, of twice the width, are recommeded. For sowing of narrow high-ridged lands, the outside coulters should be let down, and the middle ones raised, so that the points of the coulters may form the same curve that the land or ridge forms. And the loose soil harrowed down into the furrows should be returned to the edges of the lands or ridges from whence it came, by a double mould-board or other plough, whether the land be wet or dry.

Clover or other hays, intended to be sown by the machine.

Practice.

machine, should be ploughed a deep strong furrow and well harrowed, in order to level the surface, and to get as much loose soil as possible for the coulters to work in; and when sown, if any of the seed appears in the drills uncovered by reason of the stiff texture of the soil, or toughness of the roots, a light harrow may be taken over the land, once in a place, which will effectually cover the seed, without displacing it at all in the drills. For sowing lays, a considerable weight must be applied to the lever L, to force the coulters into the ground; and a set of wrought-iron coulters, well-steeled, and made sharp at the front edge and bottom, are recommended; they will pervade the soil more readily, consequently require less draught, and expedite business more than adequate to the additional expence.

For every half acre of land intended to be sown by the machine with the seed of that very valuable root, (carrot) one bushel of saw-dust, and one pound of carrot seed, should be provided; the saw-dust should be made dry, and sifted to take out all the lumps and chips, and divided into eight equal parts or heaps; the carrot-seed should likewise be dried, and well rubbed between the hands, to take off the beards, so that it will separate readily, and being divided into eight equal parts or heaps, one part of the carrot-seed must be well mixed with one part of the saw-dust, and so on, till all the parts of the carrot-seed and saw-dust are well mixed and incorporated together; in which state it may be sown very regularly in drills at twelve inches distance, by the cups or ladles N° 2. Carrot-seed resemblig saw-dust very much in its size, roughness, weight, adhesion, &c. will remain mixed as above during the sowing; a ladle full of saw-dust will, upon an average, contain three or four carrot-seeds, by which means the carrot-seed cannot be otherwise than regular in the drills. In attempting to deposit small seeds near the surface, it may so happen that some of the seeds may not be covered with soil; in which case a light roller may be drawn over the land after the seed is sown, which will not only cover the seeds, but will also, by levelling the surface, prepare the land for an earlier hoeing than could otherwise have taken place.

It has always been found troublesome, sometimes impracticable, to sow any kind of grain or seeds (even broad-cast) in a high wind. This inconvenience is entirely obviated, by placing a screen of any kind of cloth, or a sack, supported by two uprights nailed to the sides of the machine, behind the funnels, which will prevent the grain or seed being blown out of its direction in falling from the ladles into the funnels. Small pipes of tin may also be put on to the ends of the funnels, to convey the grain or seed so near the surface of the land, that the highest wind shall not be able to interrupt its descent into the drills.

Respecting the use of the machine, it is frequently remarked by some people not conversant with the properties of matter and motion, that the soil will close after the coulters, before the seed is admitted into the drills. Whereas the very contrary is the case; for the velocity of the coulters in passing through the soil, is so much greater than the velocity with which the soil closes up the drills by its own spontaneous gravity, that the incisions or drills will be constantly open for three or four inches behind the coulters; by which means, it is morally impossible (if the points of the funnels stand directly behind the coulters) that the seed with the velocity it acquires in falling through the funnels, shall not be admitted into the drills.

Plate IX.

Fig. 12. is a new constructed simple hand-hoe, by which one man will effectually hoe two chain acres per day, earthing up the soil at the same time to the rows of corn or pulse, so as to cause roots to issue from the first joint of the stem, above the surface of the land, which otherwise would never have existed.

This hoe is worked much in the same manner as a common Dutch hoe, or scuffle, is worked in gardens. The handle is elevated or depressed, to suit the size of the person that works it, by means of an iron wedge being respectively applied to the upper or under side of the handle that goes into the socket of the hoe.

The wings or moulding plates of the hoe, which are calculated to earth up the soil to the rows of corn, so as to cause roots to issue from the first joint of the stem above the surface, which otherwise would not have existed, should never be used for the first hoeing, but should always be used for the last hoeing, and used or not used, at the option of the farmer, when any intermediate hoeing is performed.

SUMMARY of the OPERATIONS necessary in executing the NEW HUSBANDRY with the PLOUGH.

222 Summary of the operations.

1. It is indispensably necessary that the farmer be provided with a drill and hoe-plough.

2. The new husbandry may be begun either with the winter or spring corn.

3. The land must be prepared by four good ploughings, given at different times, from the beginning of April to the middle of September.

4. These ploughings must be done in dry weather, to prevent the earth from kneading.

5. The land must be harrowed in the same manner as if were sowed in the common way.

6. The rows of wheat should be sowed very straight.

7. When the field is not very large, a line must be strained across it, by which a rill may be traced with a hoe for the horse that draws the drill to go in; and when the rows are sown, 50 inches must be left betwixt each rill. But, when the field is large, stakes at five feet distance from each other must be placed at the two ends. The workman must then trace a small furrow with a plough that has no mould-board, for the horse to go in that draws the drill, directing himself with his eye by the stakes.

8. The sowing should be finished at the end of September, or the beginning of October.

9. The furrows must be traced the long way of the land, that as little ground as possible may be lost in the head-lands.

10. The rows, if it can be done, should run down the slope of the land, that the water may get the easier off.

11. The seed-wheat must be plunged into a tub of lime-water, and stirred, that the light corn may come to the surface and be skimmed off.

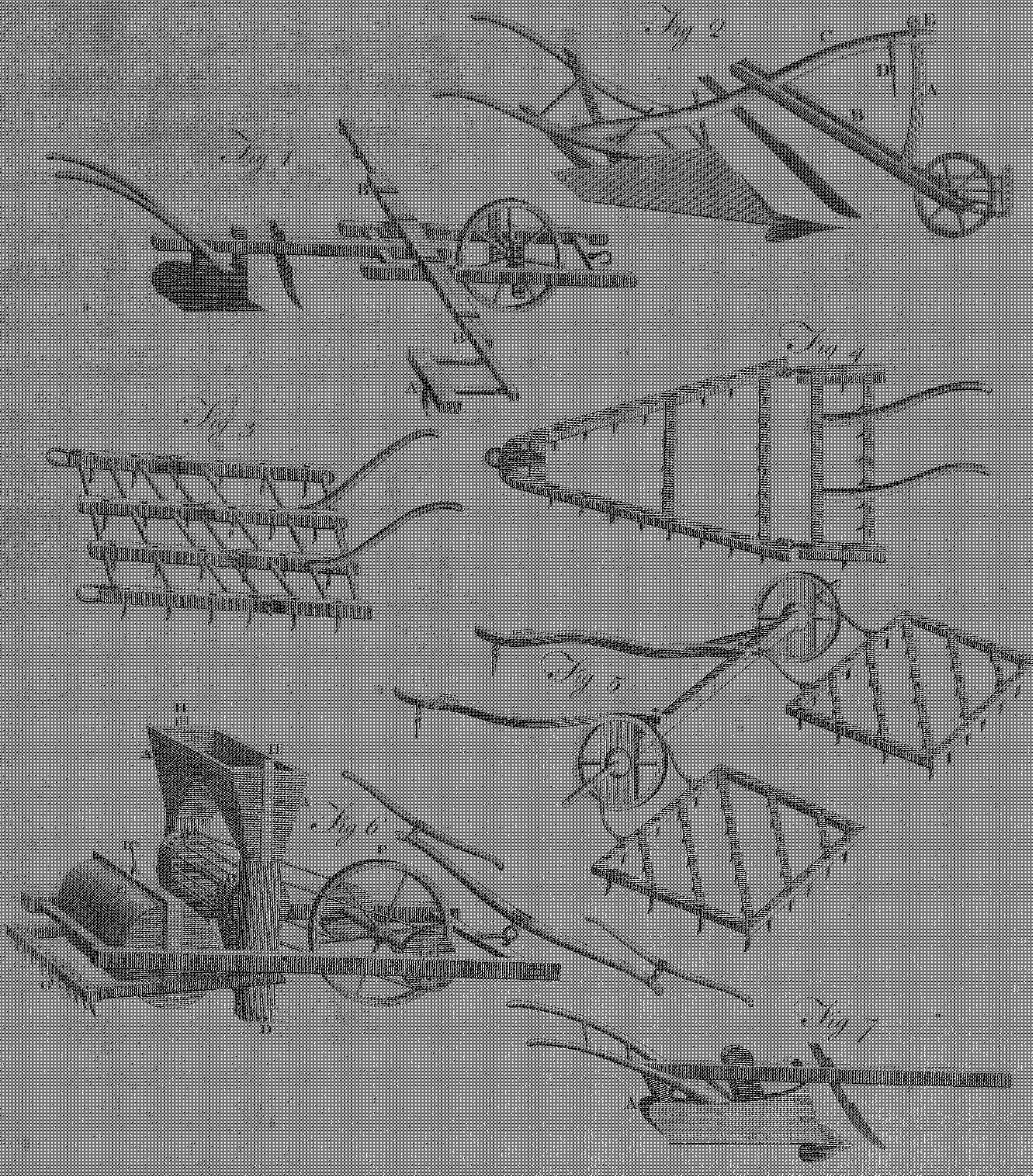
12. The seed must be next spread on a floor, and frequently stirred, till it is dry enough to run through the valves of the hopper of the drill.

13. To prevent smut, the seed may be put into a ley of ashes and lime.

14. Good

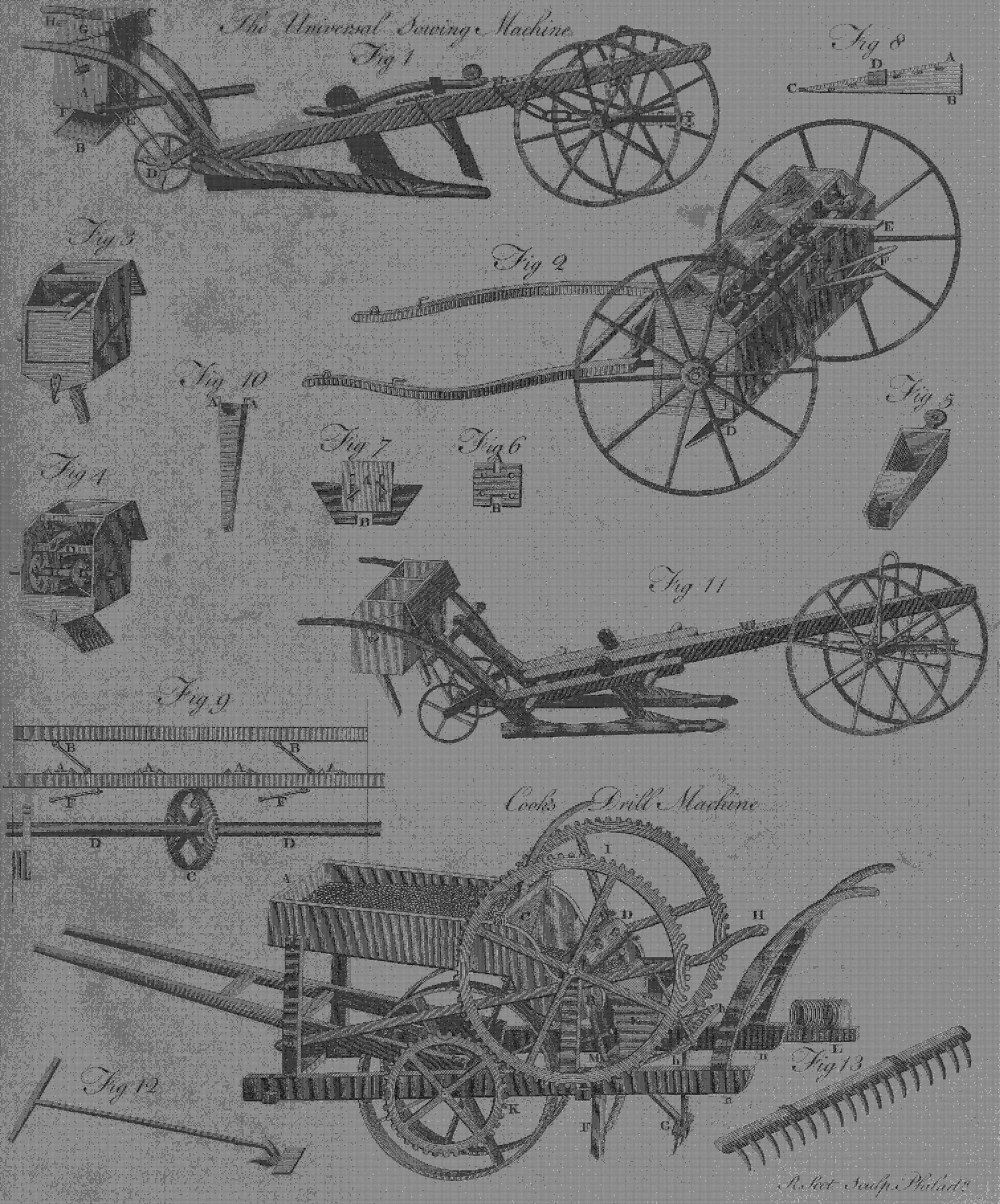
AGRICULTURE

Plate VIII



R. Scot Sculp. Phil.

AGRICULTURE Plate IX



Practice.

14. Good old seed-wheat should be chosen in preference to new, as it is found by experience not to be so subject to smut.

15. After the hoppers of the drill are filled, the horse must go slowly along the furrow that was traced. That a proper quantity of seed may be sown, the aperture of the hopper must be suited to the size of the grain.

16. As the drill is seldom well managed at first, the field should be examined after the corn has come up, and the deficiencies be supplied.

17. Upon wet soils or strong clays, wheat should not be deposited more than two inches deep, on any account whatever; nor less than two inches deep, on dry soils. From two to three inches is a medium depth for all spring corn. But the exact depth at which grain should be deposited in different soils, from the lightest sand to the strongest clay, is readily ascertained only by observing at what distance under the surface of the land, the secondary or coronal roots are formed in the spring.

18. Stiff lands, that retain the wet, must be stirred or hoed in October. This should be done by opening a furrow in the middle of the intervals, and afterward, filling it up by a furrow drawn on each side, which will raise the earth in the middle of the intervals, and leave two small furrows next the rows, for draining off the water, which is very hurtful to wheat in winter.

19. The next stirring must be given about the end of March, with a light plough. In this stirring the furrows made to drain the rows must be filled up by earth from the middle of the intervals.

20. Some time in May, the rows must be evened; which, though troublesome at first, soon becomes easy, as the weeds are soon kept under by tillage.

21. In June, just before the wheat is in bloom, another stirring must be given with the plough. A deep furrow must be made in the middle of the intervals, and the earth thrown upon the sides of the rows.

22. When the wheat is ripe, particular care must be taken, in reaping it, to trample as little as possible on the ploughed land.

23. Soon after the wheat is carried off the field, the intervals must be turned up with the plough, to prepare them for the seed. The great furrow in the middle must not only be filled, but the earth raised as much as possible in the middle of the intervals.

24. In September, the land must be again sowed with a drill, as above directed.

25. In October, the stubble must be turned in for forming the new intervals; and the same management must be observed as directed in the first year.

We pretend not to determine whether the old or new husbandry be preferable in every country. With regard to this point, the climate, the situation of particular land, skill and dexterity in managing the machinery, the comparative expence in raising crops, and many other circumstances, must be accurately attended to before a determination can be given.

The following comparative view of the old and new methods of culture, was furnished for the editors of Mr Tull's Horse-hoeing Husbandry, by a gentleman who for some years practised both in a country where the soil was light and chalky, like that from which he drew his observations. It is necessary to remark, that in the new husbandry every article is stated at its full value, and the crop of each year is four bushels short of the other; though, in several years experience, it has equalled and generally exceeded those of the neighbourhood in the old way.

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223 Comparative view of the expence and profits of the Old and New Husbandry.

"An estimate of the expence and profit of 10 acres of land in 20 years.

I. In the old way.

First year, for wheat, costs 33 l. 5s. viz.	L.	s.	d.	L.	s.	d.
First ploughing, at 6s. p. acre	3	0	0			
Second and third ditto, at 8s. per acre	4	0	0			
Manure, 30s. per acre	15	0	0			
				22	0	0
Two harrowings, and sowing, at 2s.6d. per acre	1	5	0			
Seed, three bushels per acre, at 4s. per bushel	6	0	0			
Weeding, at 2s. per acre	1	0	0			
Reaping, binding, and carrying, at 6s. per acre	3	0	0			
				11	5	0
Second year, for barley, costs 11l. 6s. 8d. viz.						
Once ploughing, at 6s. per acre	3	0	0			
Harrowing and sowing, at 1s. 6d. per acre	0	15	0			
Weeding, at 1s. per acre	0	10	0			
Seed, four bushels per acre, at 2s. per bushel	4	0	0			
Cutting, raking, and carrying, at 3s. 2d. per acre	1	11	8			
Grass-seeds, at 3s. per acre	1	10	0			
				11	6	8
				44	11	8
Third and fourth years, lying in grass, cost nothing: so that the expence of ten acres in four years comes to 44l. 11s. 8d. and in twenty years to -				222	18	4
First years produce is half a load of wheat per acre, at 7l.	35	0	0			
Second years produce is two quarters of barley per acre, at 1l. - - - -	20	0	0			
Third and fourth years grass is valued at 1l. 10s. per acre	15	0	0			
So that the produce of ten acres in four years is	70	0	0			
And in twenty years it will be				350	0	0
Deduct the expence, and there remains clear profit on ten acres in twenty years by the old way - - - -				127	1	8

II. In the new way.

First years extraordinary expence is, for ploughing and manuring the land, the same as in the old way	L.22	0	0

Ploughing

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	L.	s.	d.	L.	s.	d.
Ploughing once more, at 4s. per acre -	2	0	0			
Seed, nine gallons per acre, at 4s. per bushel -	2	5	0			
Drilling, at 7d. per acre	0	5	10			
Hand-hoeing and weeding, at 2s. 6d. per acre -	1	5	0			
Horse-hoeing six times, at 10s. per acre -	5	0	0			
Reaping, binding, and carrying, at 6s. per acre	3	0	0			
The standing annual charge on ten acres is	13	15	10			
Therefore the expence on ten acres in twenty years is - -				275	16	8
Add the extraordinaries of the first year, and the sum is - -				297	16	8
The yearly produce is at least two quarters of wheat per acre, at 1l. 8s. per quarter; which, on ten acres in twenty years amounts to				560	0	0
Therefore, all things paid, there remains clear profit on ten acres in 20 years by the new way - -				262	3	4

225 Arguments in favour of the New Method.

"So that the profit on ten acres of land in twenty years, in the new way, exceeds that in the old by L. 135 : 1 : 8, and consequently is considerably more than double thereof; an ample encouragement to practise a scheme, whereby so great advantage will arise from so small a quantity of land, in the compass of a twenty-one years lease; one year being allowed, both in the old and new way, for preparing the ground.

"It ought withal to be observed, that Mr Tull's husbandry requires no manure at all, though we have here, to prevent objections, allowed the charge thereof for the first year; and moreover, that though the crop of wheat from the drill-plough is here put only at two quarters on an acre, yet Mr Tull himself, by actual experiment and measure, found the produce of his drilled wheat-crop amounted to almost four quarters on an acre."

It appears also from a comparative calculation of expence and profit between the drill and common husbandry, taken from Mr Baker's report to the Dublin Society of his experiments in agriculture for the year 1765, that there is a clear profit arising upon an Irish acre of land in 15 years in the drill husbandry of L. 52 : 3 : 11, and in the common husbandry of L. 27 : 19 : 2; and therefore a greater profit in the drilled acre in this time of L. 24 : 4 : 9, which amounts to L. 1 : 12 : 3¾ per annum. From hence he infers, that in every 15 years the fee-simple of all the tillage-lands of the kingdom is lost to the community by the common course of tillage. In stating the accounts, from which their result is obtained, no notice is taken of fences, water-cutting the land, weeding and reaping, because these articles depend on a variety of circumstances, and will, in general, exceed in the common husbandry those incurred by the other.

Besides, the certainty of a crop is greater in this new way than in the old way of sowing; for most of the accidents attending wheat crops, are owing to their being late sown, which is necessary to the farmer in the old way; but in the horse-hoeing method the farmer may plough two furrows whereon the next crop is to stand immediately after the first crop is off. In this manner of husbandry, the land may be ploughed dry and drilled wet, without any inconvenience; and the seed is never planted under the furrow, but placed just at the depth which is most proper, that is, at about two inches; in which case it is easy to preserve it, and there is no danger of burying it. Thus the seed has all the advantage of early sowing, and none of the disadvantages that may attend it in the other way, and the crop is much more certain than by any other means that can be used.

The condition in which the land is left after the crop, is no less in favour of the horse-hoeing husbandry than all the other articles. The number of plants is the great principle of the exhausting of land. In the common husbandry, the number is vastly greater than in the drilling way, and three plants in four often come to nothing, after having exhausted the ground as much as profitable plants; and the weeds which live to the time of harvest in the common way, exhaust the land no less than so many plants of corn, often much more. The horse-hoeing method destroys all the weeds in the far greater part of the land, and leaves that part unexhausted and perfectly fresh for another crop. The wheat plants being also but a third part of the number at the utmost of those in the sowing way, the land is so much the less exhausted by them; and it is very evident from the whole, that it must be, as experience proves that it is, left in a much better condition after this than after the common husbandry.

225 Objections and answers.

The farmers who are against this method object, that it makes the plants too strong, and that they are more liable to the blacks or blights of insects for that reason; but as this allows that the hoeing can, without the use of dung, give too much nourishment, it is very plain that it can give enough; and it is the farmer's fault if he do not proportion his pains so as to have the advantage of the nourishment without the disadvantages. It is also objected, that as hoeing can make poor land rich enough to bear good crops of wheat, it may make good land too rich for it. But if this should happen, the sowing of wheat on it may be let alone a while, and in the place of it the farmer may have a crop of turnips, carrots, cabbages, and the like, which are excellent food for cattle, and cannot be over-nourished: or, if this is not chosen, the land, when thus made too rich, may soon be sufficiently impoverished by sowing corn upon it in the common old way.

The method of horse-hoeing husbandry, so strongly recommended by Mr Tull, is objected to by many on account of the largeness of the intervals which are to be left behind the rows of corn. These are required to be about five feet wide; and it is thought that such wide spaces are so much lost earth, and that the crop is to be so much the less for it. But it is to be observed, that the rows of corn separated by these intervals need not be single; they may be double, triple, or quadruple, at the pleasure of the farmer; and four rows thus standing as one will have the five foot interval but one-fourth of its bigness as to the whole quantity, and it will be but as fifteen inch intervals to plants in

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in single rows. Corn that is sown irregularly in the common way, seems indeed to cover the ground better than that in rows: but this is a mere *deceptio visus*; for the stalks of corn are never so thick as when they come out of one plant, or as when they stand in a row; and a horse-hoed plant of corn will have 20 or 30 stalks in a piece of ground of the same quantity, where an unhoed plant will have only two or three stalks. If these stalks of the hoed plant were separated and planted over the intervals, the whole land would be better covered than it is in the common way; and the truth is, that though these hoed fields seem to contain a much less crop than the common sown fields, yet they in reality do contain a much greater. It is only the different placing that makes the sown crop seem the larger, and even this is only while both crops are young.

The intervals are not lost ground, as is usually supposed, but when well horse-hoed they are all employed in the nourishment of the crop; the roots of the plants in the adjoining rows spreading themselves thro' the whole interval, and drawing such nourishment from it, that they increase accordingly. When the plants stand in the scattered way, as in common sowing, they are too close to one another; each robs its neighbours of part of their nourishment, and consequently the earth is soon exhausted, and all the plants half starved. The close standing of them also prevents the benefit of after-tilling, as the hoe cannot be brought in, nor the ground by any means stirred between them to give it a new breaking, and consequently afford them new food.

Experiments have abundantly proved, that in large grounds of wheat where the different methods have been tried, those parts where the intervals were largest have produced the greatest crops, and those where hoeing was used without dung have been much richer. than those where dung was used without hoeing. If it were possible that plants could stand as thick, and thrive as well over the whole surface of the ground, as they do in the rows separated by these large intervals, the crops of corn so produced would be vastly greater than any that have been heard of; but the truth is, that plants receive their growth not according to the ground they stand on, but to the ground they can extend their roots into; and therefore a single row may contain more plants than a large interval can nourish, and therefore the same number that stand in that row, and no more than these, could be nourished, if scattered over the whole interval; and they would be much worse nourished in that way; because while the interval is void, the earth may be stirred about them, and new roots will be formed in great numbers from every one broken by the instruments and new nourishment laid before these roots by the breaking the particles of earth, by which the plants will have supplies that they cannot have when scattered over the whole surface, because the ground is then all occupied, and cannot be moved between the plants.

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In what circumstance the new method is less proper.

All soils and all situations are not equally proper for this method of planting in rows with large intervals and hoeing between. The lightest soils seem to be best for it, and the tough and wet clays the worst. Such grounds as lie on the sides of hills are also less proper than others for this work.

This method is not so proper in common fields, but that not in respect of the soil, but of the husbandry of the owners, who are usually in the old way, and change the species of corn, and make it necessary to fallow every second, third or fourth year. Nevertheless it has been found by later experiments, that the intervals betwixt the rows of plants, as recommended by Mr Tull, were too great, perhaps double of what they should be in the most profitable method of culture; by which means much less crops are obtained than might be produced at nearly the same expence. This has rendered the profits of the drill method much less than they would have been in a more judicious practice, and, consequently, has proved a great disadvantage to it in comparison with the broad-cast. Mr Tull was led into this, partly from the want of more perfect instruments for hoeing, and of ploughs proper for drilling.

To the preceding statements, the following observations by Sir John Anstruther, published among the Select Papers of the Bath Society, may not be improperly subjoined.

227
Observations by Sir John Anstruther.

The slow progress which the drill-husbandry has made in many parts of Great Britain since Mr Tull's time, he observes, has been principally owing to the want of proper drill-ploughs. Before drilling can become general, these ploughs must be simple, such as a common ploughman accustomed to use strong instruments can use without breaking, and such also as common workmen can easily make or repair. Mathematical accuracy he considers as not required for delivering the seed: for it matters very little whether there be a quarter of a peck more or less sown, if it be delivered with tolerable regularity. He therefore had a plough made, according to his own directions, by a common plough-wright, of sufficient strength for any land made fit for turnips or wheat. It was tried on very rough ground unfit for sowing, in order to ascertain its strength; and it had been used for eight years without its needing any repair. It is a double drill-plough, which sows two ridges at a time, the horse going in the furrow between them, and of course does not tread upon the ground intended to be sown; which with a single drill must be the case, and does much harm by the horses feet sinking and making holes in the fine ground, which retain the water, and hurt the wheat when young.

He proceeds to observe, "That having read Mr Forbes upon the extensive practice of the new husbandry, and some other authors, who gave a more clear and distinct account of the different operations in drilling than had heretofore been given, I wished to try them, and to adapt my plough to sow the quantities therein directed. It was, however, adjusted to sow a smaller quantity, and the seed was not steeped.

"Not having ground so proper as I wished, it was drilled on the side of a field, the soil of which was light and sandy, and in such bad order, that the preceding crop was a very indifferent one. It was therefore manured with a compost dung-hill.

"After cross-ploughing and manuring, it was laid into four and a half feet ridges, then harrowed and drilled with one peck and a half of wheat on an acre and a quarter, which is nearly one peck and a fifth per English acre. It was drilled the 27th of October, and rolled after drilling. The crop was late in its appearance, and very backward in the spring.

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"March 31st, it was horse-hoed one furrow *from* the rows.

"April 8th, it was hand-hoed and weeded in the rows.

"25th, horse-hoed again, laying a furrow back *to* the rows.

"May 15th, hand-hoed the second time.

"June 2d, horse-hoed *from* the rows.

"June 12th, hand-hoed the third time.

"July 14th, horse-hoed *to* the rows.

"At this last hoeing, as many of the ears were beaten down into the intervals by wind and rain, a man went before the horse-hoe, and turned the ears back into their proper place.

"The crop, when reaped and threshed, yielded me 36 bushels on one acre and a quarter, which is 28 bushels and three pecks per acre; and the produce from one peck and an half 96 for one.

"As the produce appeared so great, from land in such bad order, it was carefully measured again, and found to be right. But this increase, though great, was not so large as Mr Crake of Glasgow had without dung.

"Mr Randal says 'It is an experimented fact, that on a fine loam exquisitely prepared, 144 bushels have been produced from one acre. And, I believe, it is not known what the increase may be brought to in rich land by high cultivation.'

"Some years since, I had beans dropt alternately with potatoes, at two feet distance in the rows, which were three feet apart, and ploughed in the intervals. The land adjoining was sown with beans and pease, which were a good crop; but those sown among the potatoes a better one. I pulled one stem of the beans planted with the potatoes, which had three branches rising from the bottom, and it produced 225 beans. In all the trials of drilled beans, most of the stems had two branches, with many pods upon each.——From these and other instances, I believe it is not yet known to what increase grain may be brought by drilling, good cultivation, and manure.

"Horse-hoeing is certainly preferable to close drilling or hand-hoeing; but the latter is superior to broadcast.

"Horse-hoeing the full depth increases the crop, by making it tiller or branch more than it otherwise would do; and the advantage is distinctly observable every hoeing, by the colour of the grain. It prepares the ground for the next crop, at the same time that it increases the crop growing, which hand-hoeing does not, although it may destroy the weeds. Thus drilled ground is kept in a loose open state to receive the benefit of the influence of the air and weather, which broadcast has not; and it is evident, from certain experience, that crops may be drilled many years to good advantage without manure.

"Suppose the crops only 20 bushels per acre, what course of broadcast crops will give 5l. an acre for the course? But suppose they are dunged the same as any ground in the most approved course, there is the greatest reason to expect as much as in the above experiment, which is 28 and three-quarters, and at 5s. per bushel amounts to 7l. 3s. 9d.

"Calculations may be of service to those who wish to try drilling, and have few books to direct them.

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"One acre is 10 chains long, of 660 feet, or 220 yards long, and one yard broad, containing 4840 square yards. Then if the ridge is four feet six inches, this makes 14 ridges, and three feet to spare. This length of 220 yards, multiplied by 14 (the number of ridges) gives a length of yards 3080, to which add 146 for the spare three feet, and it will be 3226 yards. And as two rows are drilled on a ridge, the number of rows will be in length 6452 yards; but as a deduction of 172 yards must be made for the head ridges, suppose three yards each, &c. the whole length to be sown will be 6280 yards clear. Now a gallon (Winchester) holds about 80,000 grains. The quantity recommended to be drilled by Mr Forbes and others, being six gallons, or two-thirds of a bushel per acre, is nearly 78 grains to a yard, or 26 to a foot. But in my experiment, by this calculation, it was only about 11 grains to a foot; which is quite sufficient, if the seed be good, and it be not destroyed by vermin.

"Now with regard to the quantity of land this drill-plough may sow; if a horse walks at the rate of two miles per hour, he goes 16 miles in eight hours, or 28,460 yards. As he sows two ridges at once, this is seven lengths and two-thirds per acre, or 1686 yards to sow an acre, being nearly 17 acres in a day.

"Four horse-hoeings are calculated equal to two ploughings. In plain ploughing they suppose the ridge is ploughed with four furrows, or eight for twice ploughing. The four horse-hoeings are eight furrows, equal to two ploughings.

"Mr Tull directs four hoeings, and Mr Forbes five. First, In November, when the plant has four blades. 2dly, In March, deep, and nearer the rows than the former; both these hoeings should be *from* the rows. 3dly, Hand-hoed when it begins to spindle, if the earth be crumbly, *to* the rows. 4thly, When it begins to blossom, *from* the rows, but as near to them as in the second hoeing. 5thly, When done blossoming, to ripen and fill the grain, *to* the rows.

"The last hoeing Mr Tull does not direct, but Mr Forbes advises it, as being of essential service in filling the grain, and saving trouble in making the next seed-furrows. They advise the patent or sowing-plough for horse-hoeing; and the expence is calculated by Mr Crake at one guinea per acre, reaping included.

"But let us suppose the following, which are the prices in the county I live in (Fife).

	L.	s.	d.
Ploughing to form the ridges, -	0	4	0
Harrowing, - - -	0	0	4
Four hoeings, equal to two ploughings,	0	8	0
Sowing, - - -	0	0	4
Hand-hoeing twice, - -	0	8	0
Seed, one peck and a half, at 5s. a bushel,	0	1	10
Whole expence per acre, -	L. 1	2	6."

228 The drill and the broad-cast methods more particularly compared.

Drill husbandry is, as a good writer has justly defined it, "*the practice of a garden brought into the field.*" Every man of the least reflection must be sensible, that the practice of the garden is much *better* than that of the field, only a little more expensive; but if (as is the case) this extra expence be generally much more than repaid by the superior goodness and value of drilled crops, it ought to have no weight in comparing the two modes of husbandry.

In the broadcaſt method the land is often ſown in bad tilth, and always ſcattered at random, ſometimes by very unſkilful hands. In drilling, the land muſt be in fine order; the ſeed is ſet in trenches drawn regularly, all of nearly an equal depth, and that depth ſuited to the nature of each kind of ſeed. Theſe ſeeds are alſo diſtributed at proper diſtances, and by being equally and ſpeedily covered, are protected from vermin and other injuries; ſo that the practice of the garden is here exactly introduced into the field.

In the broadcaſt method the ſeed falls in ſome places too thick, in others too thin; and being imperfectly covered, a part of it is devoured by vermin which follow the ſower; another part is left expoſed to rain or froſt, or to heats, which greatly injure it. When harrowed, a great part of it (ſmall ſeeds eſpecially) is buried ſo deep, that if the ſoil be wet, it periſhes before it can vegetate.

Again: When thus ſown there is no meddling with the crop afterwards, becauſe its growth is irregular. The ſoil cannot be broken to give it more nouriſhment, nor can even the weeds be deſtroyed without much inconvenience and injury.

But in the drill-huſbandry the intervals between the rows, whether double or ſingle, may be horſe-hoed; and thereby nouriſhment may repeatedly be given to the plants, and the weeds almoſt totally deſtroyed.

The very ſame effects which digging has upon young ſhrubs and trees in a garden, will reſult from horſe-hoeing in a field, whether the crop be corn or pulſe: For the reaſon of the thing is the ſame in both caſes, and being founded in nature and fact, cannot ever fail. In drilling, no more plants are raiſed on the ſoil than it can well ſupport; and by dividing and breaking the ground they have the full advantage of all its fertility.

The plough prepares the land for a crop, but goes no further; for in the broadcaſt huſbandry it cannot be uſed: but the crop receives greater benefit from the tillage of the land by the horſe-hoe, while it is growing, than it could in the preparation. No care in tilling the land previous to ſowing can prevent weeds riſing with the crop; and if theſe weeds be not deſtroyed while the crop is growing, they will greatly injure it. In the broadcaſt huſbandry this cannot be done; but in drilling, the horſe-hoe will effect it eaſily.

And what adds to the farmer's misfortune is, that the moſt pernicious weeds have ſeeds winged with down, which are carried by the wind to great diſtances; ſuch are thiſtles, ſow-thiſtles, colts-foot, and ſome others.

If the expence of horſe-hoeing be objected, there are two anſwers which may very properly be made: The firſt is, that this expence is much leſs than that of hand-hoeing were it practicable, or of hand-weeding. The ſecond is, that it is more than repaid by the quantity of ſeed ſaved by drilling; to ſay nothing of the extra quantity and goodneſs of the crops, which are generally ſelf-evident.

Upon the whole: If the particular modes of cultivating land by the new huſbandry ſhould, after all, be conſidered as perhaps too limited to be univerſally adopted; yet it has been of great uſe in raiſing ſuſpicions concerning the old method, and in turning the views of philoſophers and farmers towards improving in general. Many real improvements in agriculture have been the conſequences of theſe ſuſpicions; and as this ſpirit of inquiry remains in full vigour, a ſolid foundation is laid for expecting ſtill further improvements in this uſeful art.

AGRIFOLIUM, or AQUIFOLIUM. See ILEX.

AGRIGENTUM, (anc. geog.), a city of Sicily, part of the ſite of which is now occupied by a town called *Cirgenti* from the old name. See GIRGENTI.

According to ancient authors, Dedalus, the moſt famous mechanician of fabulous antiquity, fled to this ſpot for protection againſt Minos, and built many wonderful edifices for Cocalus king of the iſland. Long after his flight, the people of Gela ſent a colony hither 600 years before the birth of Chriſt; and from the name of a neighbouring ſtream called the new city *Acragas*, whence the Romans formed their word *Agrigentum*. Theſe Greeks converted the ancient abode of the Siculi into a citadel to guard the magnificent city, which they erected on the hillocks below.

An advantageous ſituation, a free goverment with all its happy effects, and an active commercial ſpirit, exalted their commonwealth to a degree of riches and power unknown to the other Greek ſettlements, Syracuſe alone excepted. But the proſperity of Agrigentum appears to have been but of ſhort duration, and tyranny ſoon deſtroyed its liberties.

Phalaris was the firſt that reduced it to ſlavery. His name is familiar to moſt readers on account of his cruelty, and the brazen bull in which he tortured his enemies: (See PHALARIS.)—Phalaris met with the common fate of tyrants, and after his death the Agrigentines enjoyed their liberty for 150 years; at the expiration of which term Thero uſurped the ſovereign authority. The moderation, juſtice, and valour of this prince preſerved him from oppoſition while living, and have reſcued his memory from the obloquy of poſterity. He joined his ſon-in-law Gelo, king of Syracuſe, in a war againſt the Carthaginians; in the courſe of which victory attended all his ſteps, and Sicily ſaw herſelf for a time delivered from her African oppreſſions. Soon after his deceaſe, his ſon Thraſydeus was deſpoiled of the diadem, and Agrigentum reſtored to her old democratical government. Ducetius next diſturbed the general tranquillity. He was a chief of the mountaineers, deſcendants of the Siculi: and was an overmatch for the Agrigentines while they were unſupported by alliances, but ſank under the weight of their union with the Syracuſans. Some trifling altercations diſſolved this union, and produced a war, in which the Agrigentines were worſted, and compelled to ſubmit to humiliating terms of peace. Reſentment led them to embrace with joy the propoſals of the Athenians, then meditating an attack upon Syracuſe. Their new friends ſoon made them feel that the ſacrifice of liberty and fortune would be the price of their protection; and this conſideration brought them ſpeedily

Agrigentum. ſpeedily back to their old connections. But as if it had been decreed that all friendſhip ſhould be fatal to their repoſe, the reconciliation and its effects drew upon them the anger of the Carthaginians. By this enemy their armies were routed, their city taken, their race almoſt extirpated, and ſcarce a veſtige of magnificence was left. Agrigentum lay 50 years buried under its own ruins; when Timoleon, after triumphing over the Carthaginians, and reſtoring liberty to Sicily, collected the deſcendants of the Agrigentines, and ſent them to re-eſtabliſh the dwellings of their forefathers. Their exertions were rewarded with aſtoniſhing ſucceſs; for Agrigentum roſe from its aſhes with ſuch a renewal of vigour, that in a very ſhort time we find it engaged in the bold ſcheme of ſeizing a lucky moment, when Agathocles and Carthage had reduced Syracuſe to the loweſt ebb, and arrogating to itſelf ſupremacy over all the Sicilian republics. Xenodicus was appointed the leader of this arduous enterpriſe; and had his latter operations been as fortunate as his firſt campaign, Agrigentum would have acquired ſuch a preponderance of reputation and power, that the rival ſtates would not even have dared to attack it. But a few brilliant exploits were ſucceeded by a ſevere overthrow; the Agrigentines loſt courage, diſagreed in council, and humbly ſued for peace to Agathocles. This commonwealth afterwards took a ſtrong part with Pyrrhus; and when he left Sicily to the mercy of her enemies, threw itſelf into the arms of Carthage. During the firſt Punic war Agrigentum was the head-quarters of the Carthaginians, and was beſieged by the Roman conſuls, who after eight months blockade took it by ſtorm. It nevertheleſs changed maſters ſeveral times during the conteſt between thoſe rival ſtates, and in every inſtance ſuffered moſt cruel outrages. After this period very little mention of it occurs in hiſtory, nor do we know the preciſe time of the deſtruction of the old city and the building of the new one. See GIRGENTI.

The principal part of the ancient city lay in the vale; the preſent town, called Girgenti, occupies the mountain on which the citadel of Cocalus ſtood.

It was difficult to be more judicious and fortunate in the choice of ſituation for a large city. The inhabitants were here provided with every requiſite for defence, pleaſure, and comfort of life; a natural wall, formed by abrupt rocks, preſented a ſtrong barrier againſt aſſailants; pleaſant hills ſheltered them on three ſides without impeding the circulation of air; before them a broad plain watered by the Acragas, gave admittance to the ſea-breeze, and to a noble proſpect of that awful element; the port or emporium lay in view at the mouth of the river, and probably the road acroſs the flat was lined with gay and populous ſuburbs.

The hoſpitality and parade for which the Agrigentines are celebrated in hiſtory were ſupported by an extenſive commerce; by means of which, the commonwealth was able to reſiſt many ſhocks of adverſity, and always to riſe again with freſh ſplendour. It was, however, cruſhed by the general fall of Grecian liberty; the feeble remnants of its population, which had ſurvived ſo many calamities, were at length driven out of its walls by the Saracens, and obliged to lock themſelves up for ſafety among the bleak and inacceſſible rocks of the preſent city.

Agrigentum. At the north-eaſt angle of the ancient limits, upon ſome foundations of large regular ſtones, a church has been erected; a road appears hewn in the ſolid rock for the convenience of the votaries that viſited this temple in ancient days. It was then dedicated to Ceres and her daughter Proſerpine, the peculiar patroneſſes of Sicily. Biſhop Blaiſe has ſucceeded to their honours.

At the ſouth-eaſt corner, where the ground, riſing gradually, ends in a bold eminence, which is crowned with majeſtic columns, are the ruins of a temple ſaid to have been conſecrated to Juno. To the weſt of this, ſtands the building commonly called the *Temple of Concord;* the ſtone of which, and the other buildings, is the ſame as that of the neighbouring mountains and cliffs, a conglutination of ſea-ſand and ſhells, full of perforations, of a hard and durable texture, and a deep reddiſh brown colour. This Doric temple has all its columns, entablature, pediments, and wall entire; only part of the roof is wanting. It owes its preſervation to the piety of ſome Chriſtians, who have covered half the nave, and converted it into a church conſecrated under the invocation of St Gregory, biſhop of Girgenti.

Proceeding in the ſame direction, you walk between rows of ſepulchres cut in the rock wherever it admitted of being excavated by the hand of man, or was ſo already by that of nature. Some maſſes of it are hewn into the ſhape of coffins; others drilled full of ſmall ſquare holes employed in a different mode of interment, and ſerving as receptacles of urns. One ponderous piece of the rock lies in an extraordinary poſition; by the failure of its foundation, or the ſhock of an earthquake, it has been looſened from the general quarry, and rolled down the declivity, where it now remains ſupine with the cavities turned upwards. Only a ſingle column marks the confuſed heaps of moſs-grown ruins belonging to the temple of Hercules. It ſtood on a projecting rock above a chaſm in the ridge, which was cut through for a paſſage to the emporium.

In the ſame track, over ſome hills, is ſituated the building uſually called the tomb of Thero. It is ſurrounded by aged olive-trees, which caſt a wild irregular ſhade over the ruin. The edifice inclines to the pyramidical ſhape, and conſiſts at preſent of a triple plinth and a baſe ſupporting a ſquare pedeſtal: upon this plain ſolid foundation is raiſed a ſecond order, having a window in each front, and at each angle two Ionic pilaſters crowned with an entablature of the Doric order. Its inſide is divided into a vault, a ground room, and one in the Ionic ſtory, communicating with each other by means of a ſmall internal ſtaircaſe.

In the plain are ſeen the fragments of the temple of Eſculapius; part of two columns and two pilaſters, with an intermediate wall, ſupport the end of a farmhouſe, and were probably the front of the cella. Purſuing the track of the walls towards the weſt, you arrive at a ſpot which is covered with the gigantic remains of the temple of Jupiter the Olympian, minutely deſcribed by Diodorus Siculus. It may literally be ſaid that it has not one ſtone left upon another; and it is barely poſſible, with the help of much conjecture, to diſcover the traces of its plan and dimenſions. Diodorus

odorus calls it the largest temple in the whole island: but adds, that the calamities of war caused the work to be abandoned before the roof could be put on; and that the Agrigentines were ever after reduced to such a state of poverty and dependence, that they never had it in their power to finish this superb monument of the taste and opulence of their ancestors. The length of this temple was 370 Greek feet, its breadth 60, and its height 220, exclusive of the foundations or basement story; the extent and solidity of its vaults and underworks were wonderful; its spacious porticoes and exquisite sculpture were suited to the grandeur of the whole. It was not built in the usual style of Sicilian temples with a cella of massive walls and a perystile, but was designed in a mixt taste with half columns let into the walls on the outside, the inside exhibiting a plain surface.

The next ruin belongs to the temple of Castor and Pollux; vegetation has covered the lower parts of the building, and only a few fragments of columns appear between the vines. This was the point of the hill where the wall stopt on the brink of a large fish pond spoken of by Diodorus: it was cut in the solid rock 30 feet deep, and water was conveyed to it from the hills. In it was bred a great quantity of fish for the use of public entertainments; swans and various other kinds of wild fowl swam along its surface, for the amusement of the citizens, and the great depth of water preventing an enemy from surprising the town on that side. It is now dry and used as a garden. On the opposite bank are two tapering columns without their capitals, most happily placed in a tuft of carob trees. Monte Toro, where Hanno encamped with the Carthaginian army, before the Roman consuls drew him into an engagement that ruined his defensive plan, is a noble back ground to this picturesque group of objects. —The whole space comprehended within the walls of the ancient city abounds with traces of antiquity, foundations, brick-arches, and little channels for the conveyance of water; but in no part are any ruins that can be presumed to have belonged to places of public entertainment. This is the more extraordinary, as the Agrigentines were a sensual people, fond of shews and dramatic performances, and the Romans never dwelt in any place long without introducing their savage games. Theatres and amphitheatres seem better calculated than most buildings to resist the outrages of time; and it is surprising that not even the vestiges of their form should remain on the ground.

AGRIMONIA, Agrimony: a genus of the diginia order, belonging to the dodecandria class of plants; and in the natural method ranking under the 35th order, *Senticosæ*. The characters are these: The *calyx* is a monophyllous peranthium, divided into five acute segments, persistent, and fenced with another calyx: The *corolla* consists of five petals, flat, and crenated at the ends: The *stamina* have ten capillary filaments, shorter than the corolla, and inserted into the calyx; the antheræ are small, didymous, and compressed; the *pistillum* has a germen beneath; the styli are two, simple, and the length of the stamina: There is no *pericarpium*; the calyx is contracted in the neck, and indurated: The seeds are two, and roundish. Of this genus there are five species enumerated by botanical writers; but none of them have any remarkable properties except the two following.

Species and properties. 1. The eupatoria, or common agrimony, grows naturally in several parts of Britain by the sides of hedges and of woods. It is eat by sheep and goats, but refused by horses and swine. The Canadians are said to use an infusion of the root in burning fevers with great success. An infusion of six ounces of the crown of the root in a quart of boiling water, sweetened with honey, and half a pint of it drank three times a-day, is an effectual cure for the jaundice, according to Dr Hill. He advises to begin with a vomit, afterwards to keep the belly soluble, and to continue the medicine as long as any symptoms of the disease remain. It is said to be an aperient, detergent, and strengthener of the viscera. Hence it is recommended in scorbutic disorders, in debility and laxity of the intestines, &c. Digested in whey, it affords an useful diet-drink for the spring-season, not ungrateful to the palate or stomach. Doctor Alston says, that the best mode of administering this herb is in powder, when the intention is to corroborate; and that if thus taken in a large quantity, we may expect many of the effects of the bark from it in agues.

2. The odorata, or sweet-scented agrimony. This grows near four feet high; the leaves have more pinnæ than the former; the serratures of the leaves are also sharper, and, when handled they emit an agreeable odour. The leaves of this species make an agreeable cooling tea, which is sometimes prescribed by physicians as a drink for people in fevers.

Culture. Both these species may be propagated either by seed, or by parting the roots in autumn when the leaves begin to decay. The seeds ought also to be sown in this season; for if kept out of the ground till spring, they seldom come up that year.—Agrimony is a hardy perennial plant, and will thrive in almost any soil or situation; but the plants should not be placed nearer one another than two feet, that the roots may have room to spread.

Hemp Agrimony. See Eupatorium.

Water Hemp Agrimony. See Bidens.

AGRIONIA, in Grecian antiquity, festivals annually celebrated, by the Bœotians, in honour of Bacchus. At these festivals, the women pretended to search after Bacchus as a fugitive; and, after some time, gave over their inquiry, saying, that he was fled to the Muses, and was concealed among them.

AGRIOPHAGI, in antiquity, a name given to those who fed on wild beasts. The word is Greek, compounded of αγριος, "wild," "savage," and φαγω, "I eat." The name is given, by ancient writers, to certain people, real or fabulous, said to have fed altogether on lions and panthers. Pliny and Solinus speak of *Agriophagi* in Ethiopia, and Ptolemy of others in India on this side the Ganges.

AGRIPPA, in midwifery, a term applied to children, brought forth with their feet foremost.

Agrippa (Herod), the son of Aristobulus and Mariamne, and grandson to Herod the Great, was born in the year of the world 3997, three years before the birth of our Saviour, and seven years before the vulgar æra. After the death of Aristobu-

Agrippa.

lus his father, Josephus informs us, that Herod his grandfather took care of his education, and sent him to Rome to make his court to Tiberius. The emperor conceived a great affection for Agrippa, and placed him near his son Drusus. Agrippa very soon won the graces of Drusus, and of the empress Antonia. But Drusus dying suddenly, all those who had been much about him were commanded by Tiberius to withdraw from Rome, lest the sight and presence of them should renew his affliction. Agrippa, who had indulged his inclination to liberality, was obliged to leave Rome overwhelmed with debts, and in a very poor condition. He did not think it fit to go to Jerusalem, because he was not able to make a figure there suitable to his birth. He retired therefore to the castle of Massada, where he lived rather like a private person than a prince. Herod the Tetrarch, his uncle, who had married Herodias his sister, assisted him for some time with great generosity. He made him principal magistrate of Tiberias, and presented him with a large sum of money: but all this was not sufficient to answer the excessive expences and profusion of Agrippa; so that Herod growing weary of assisting him, and reproaching him with his bad œconomy, Agrippa took a resolution to quit Judea and return to Rome. Upon his arrival, he was received into the good grace of Tiberius, and commanded to attend Tiberius Nero the son of Drusus. Agrippa, however, having more inclination for Caius the son of Germinicus, and grandson of Antonia, chose rather to attach himself to him: as if he had some prophetic views of the future elevation of Caius, who at that time was beloved by all the world. The great assiduity and agreeable behaviour of Agrippa so far engaged this prince, that he kept him continually about him.

Agrippa being one day overheard by Eutyches, a slave whom he had made free, to express his wishes for Tiberius's death and the advancement of Caius, the slave betrayed him to the Emperor; whereupon Agrippa was loaded with fetters, and committed to the custody of an officer. Tiberius soon after dying, and Caius Caligula succeeding him, the new emperor heaped many favours and much wealth upon Agrippa; changing his iron fetters into a chain of gold; set a royal diadem upon his head; and gave him the tetrarchy which Philip, the son of Herod the Great, had been possessed of, that is, Batanæa and Trachonitis. To this he added that of Lysanias; and Agrippa returned very soon into Judea to take possession of his new kingdom.

Caius being soon after killed, Agrippa who was then at Rome, contributed much by his advice to maintain Claudius in possession of the imperial dignity, to which he had been advanced by the army. But in this affair Agrippa acted a part wherein he showed more cunning and address than sincerity and honesty; for while he made a show of being in the interest of the senate, he secretely advised Claudius to be resolute, and not to abandon his good fortune. The Emperor, as an acknowledgment for his kind offices, gave him all Judea and the kingdom of Chalcis, which had been possessed by Herod his brother. Thus Agrippa became of a sudden one of the greatest princes of the East; and was possessed of as much, if not more, territories than had been held by Herod the Great his grandfather. He returned to Judea, and governed it to the great satisfaction of the Jews. But the desire of pleasing them, and a mistaken zeal for their religion, induced him to commit an unjust action, the memory of which is preserved in Scripture, Acts xii. 1, 2, &c. for about the feast of the passover, in the year of Jesus Christ 44, St James major, the son of Zebedee and brother to St John the Evangelist, was seized by his order and put to death. He proceeded also to lay hands on St Peter, and imprisoned him, waiting till the festival was over, that he might then have him executed. But God having miraculously delivered St Peter from the place of his confinement, the designs of Agrippa were frustrated. After the passover, this prince went from Jerusalem to Cæsarea, and there had games performed in honour of Claudius. Here the inhabitants of Tyre and Sidon waited on him to sue for peace. Agrippa being come early in the morning to the theatre, with a design to give them audience, seated himself on his throne, dressed in a robe of silver-tissue, worked in the most admirable manner. The rising sun darted on it with its rays, and gave it such a lustre as the eyes of the spectators could not endure. When therefore the king spoke to the Tyrians and Sidonians, the parasites around him began to say, that it was the voice of a god, and not that of a man. Instead of rejecting these impious flatteries, Agrippa received them with an air of complacency; but at the same time observed an owl above him on a cord. He had seen the same bird before when he was in bonds by order of Tiberius; and it was then told him, that he should be soon set at liberty: but that whenever he saw the same thing a second time, he should not live above five days afterwards. He was therefore extremely terrified; and he died at the end of five days, racked with tormenting pains in his bowels, and devoured with worms. Such was the death of Herod Agrippa, after a reign of seven years, in the year of Christ 44.

Agrippa.

Agrippa II. son of the preceding Herod, was made king of Chalcide; but three or four years after, he was deprived of that kingdom by Claudius, who gave him in the place of it other provinces. In the war Vespasian carried on against the Jews. Herod sent him a succour of 2000 men; by which it appears, that tho' a Jew by religion, yet he was entirely devoted to the Romans, whose assistance he indeed wanted, to secure the peace of his own kingdom. He lived to the third year of Trajan, and died at Rome A. C. 100. He was the seventh and last king of the family of Herod the Great. It was before him and Berenice his sister, that St Paul pleaded his cause at Cæsarea.

Agrippa (Marcus Vespanius) son-in-law to Augustus, of mean birth, but one of the most considerable generals among the Romans. Augustus's victory over Pompey and Mark Anthony was owing to his counsel: he adorned the city with the pantheon, baths, aqueducts, &c.

Agrippa (Cornelius), born at Cologne in 1486, a man of considerable learning, and by common report a great magician; for the monks at that time suspected every thing of heresy or sorcery which they did not understand. He composed his *Treatise on the Excellence of Women*, to insinuate himself into the favour of Margaret of Austria, governess of the Low-Countries. He accepted of the charge of historiographer to the emperor,

ror, which that princess gave him. The treatise of the *Vanity of the Sciences*, which he published in 1530, enraged his enemies extremely; as did that of *Occult Philosophy*, which he printed soon after at Antwerp. He was imprisoned in France for something he had written against Francis I.'s mother; but was enlarged, and went to Grenoble, where he died in 1534. His works are printed in two volumes octavo.

AGRIPPINA, daughter of Germanicus, sister of Caligula, and mother of Nero; a woman of wit, but excessively lewd. She was thrice married, the last time to Claudius her own uncle, whom she poisoned to make way for Nero her son, Nero afterward caused her to be murdered in her chamber, when she bid the executioner stab her first in the belly that had brought forth such a monster.

AGRIPPINA COLONIA UBIORUM (anc. geog.), now *Cologne*: so called from Agrippina, the daughter of Germanicus, and mother of Nero, who had a colony sent thither at her request by the emperor Claudius, to honour the place of her birth. See COLOGNE.

AGRIPPINIANS, in church-history, the followers of Agrippinus bishop of Carthage, in the third century, who first introduced and defended the practice of re-baptization.

AGROM, a disease frequent in Bengal and other parts of the Indies, wherein the tongue chaps and cleaves in several places, being extremely rough withal, and sometimes covered with white spots. The Indians are very fearful of this disease, which they attribute to extreme heat of the stomach. Their remedy is, to drink some chalybeate liquor, or the juice of mint.

AGROSTEMA, WILD LYCHNIS, or CAMPION: A genus of the pentagynia order, belonging to the decandria class of plants; and in the natural method ranking under the 22d order, *Caryophyllei*. The characters are: The *calyx* is a single-leaved perianthium, leathery, tubular, quinquedentated, and persistent: The *corolla* consists of five ungulated petals: The *stamina* have ten subulated filaments; the antheræ are simple: The *pistillum* has an egg-shaped germen; the styli are five, filiform, erect, and the length of the stamina; the stigmata are simple: The *pericarpium* is an oblong covered capsule, having two cells and five valves: The *seeds* are numerous and kidney shaped; the receptacula are as many as the seeds, the interior ones gradually longer.

Species. The most remarkable are, 1, The githago, hairy wild lychnis, or common campion, which grows naturally in corn-fields in most parts of Britain. The flowers appear in June, are generally purple, sometimes white, and by cultivation yellow.

2. The coronaria, or single-rose campion. Of this species there are four varieties; one with deep red, another with flesh-coloured, a third with white flowers; and a sort with double flowers, which has turned most of the others out of the gardens.

3. The flos jovis, or umbelliferous mountain-campion, grows naturally upon the Helvetian mountains. It is a low plant with woolly leaves: the flower-stem rises near a foot high; the flowers grow in umbels on the top of the stalk, and are of a bright red colour. They appear in July, and the seeds ripen in September.

Culture. The first and third species are annual plants, so must be propagated by seeds; but as the first is found naturally in corn-fields, it is very seldom cultivated in gardens; the third sort should have a shady situation, and thrives best in a strong soil. The second species is perennial, but only those varieties which have single flowers produce any seeds; the double kind, therefore, as it produces no seeds, must be propagated by parting the roots in autumn, after the flowers are past. In doing this, every head which can be slipped off with roots should be parted: these should be planted in a border of fresh undunged earth, at the distance of six inches one from the other, observing to water them gently until they have taken root; after which they will require no more; for much wet is very injurious to them, as is also dung. In this border they may remain till spring, when they should be planted in the borders of the flower-garden, where they will be very ornamental during the time of their flowering, which is in July and August.—This plant is eat by horses, goats, and sheep.

AGROSTIS, BENT-GRASS, in botany: A genus of the triandria order, belonging to the digynia class of plants; and, in the natural method, ranking under the 4th order, *Gramina*. The characters are: The *calyx* is a one-flowered, two-valved, pointed gluma, rather less than the corolla. The *corolla* is two-valved and pointed. The *stamina* have three capillary filaments, which are larger than the corolla. The *antheræ* are forked. The *pistillum* has a roundish germen; the styli are two, reflected, and villous; the stigmata hisped longitudinally. The *pericarpium* is the corolla growing to the seed, not gaping. The *seed* is one, globular, and pointed at both ends. There are 15 species; eight of them natives of Britain.

AGROSTOGRAPHIA, signifies the history or description of grasses. See GRASS.

AGROUND, the situation of a ship whose bottom, or any part of it, hangs, or rests upon the ground, so as to render her immoveable, till a greater quantity of water floats her off, or till she is drawn out into the stream by the application of mechanical powers.

AGRYPNIA, among physicians, implies an inaptitude to sleep; a troublesome symptom of feverish and other disorders.

AGRYPNIA, in the Greek church, implies the vigil of any of the greater festivals.

AGUE, a general name for all periodical fevers, which, according to the different times of the returns of the feverish paroxysm, are denominated tertian, quartian, and quotidian. See MEDICINE (Index.)

AGUE-Cake, the popular name for a hard tumour on the left side of the belly, lower than the false ribs, said to be the effect of intermitting fevers.

AGUE-Tree, a name given to the sassafras, on account of its febrifuge qualities.

AGUEPERSE, a town of France, situated on the Lyonnois, about 15 miles north of Clermont.

AGUILLANEUF, or AUGUILLANEUF, a form of rejoicing used among the ancient Franks on the first day of the year. The word is compounded of the French *A* "to," *gui* "misleto," and *l'an neuf* "the new year." Its origin is traced from a druid-ceremony: the priests used to go yearly in December, which with them was reputed a sacred month, to gather misleto of the oak in great solemnity. The prophets marched in the front, singing hymns in honour of their deities;

after them came a herald with a caduceus in his hand; these were followed by three druids a-breast, bearing the things necessary for sacrifice; last of all came the chief or arch druid, accompanied with the train of people. The chief druid climbing the oak, cut off the misleto with a golden sickle, and the other druids received it in a white cloth; on the first day of the year it was distributed among the people, after having blessed and consecrated it by crying *A gui l'an neuf*, to proclaim the new year. This cry is still continued in Picardy, with the addition of *Plantez, Plantez*, to wish a plentiful year. In Burgundy and some other parts, the children use the same word to beg a new-year's gift. Of later times the name *Aguillaneuf* was also given to a sort of begging, practised in some dioceses, for church-tapers, on new-year's day, by a troop of young people of both sexes, having a chief, &c. It was attended with various ridiculous ceremonies, as dancing in the church, &c. which occasioned the synods to suppress it.

AGUILLAR, a town of Spain, in the province of Navarre, about 24 miles west of Estella.

Aguillar Del Campo, a town of Old Castile, with the title of marquisate, about 15 leagues north of the city of Burgos.

AGUILLONIUS (Francis), a Jesuit, born at Brussels: he was rector of the Jesuits college at Antwerp, and eminent for his skill in mathematics. He was the first who introduced that science among the Jesuits in the low countries: he wrote a book of Optics, and was employed in finishing his Catoptrics and Dioptrics, when death prevented him in 1617.

AGUIRRA (Joseph Sænz de), a Benedictine, and one of the most learned men in the 17th century, was born March 24. 1630. He was censor and secretary of the supreme council of the inquisition in Spain, and interpreter of the scriptures in the university of Salamanca. He printed three volumes in folio upon Philosophy, a commentary upon Aristotle's ten books of Ethics, and other pieces. He died at Rome August 19. 1699.

AGUL, in botany, a synonime of the hedysarum. See Hedysarum.

AGUR. The xxxth chapter of the Proverbs begins with this title: "The words of Agur, the son of Jakeh;" which, according to the signification of the original terms, may be translated, as the Vulgate has it, *Verba congregantis, filii vomentis;* which translation Le Clerc condemns, supposing these to be proper names, which ought not to be translated. These words are rendered by Lewis de Dieu: "The words of him who has recollected himself, the son of obedience." The generality of the fathers and commentators will have it, that Solomon describes himself under the name of Agur the son of Jakeh; others conjecture that Agur, as well as Lemuel (in chap. xxxi. 1.) were wise men who lived in the time of Solomon, and were his interlocutors in the book of Proverbs; an opinion which F. Calmet thinks is without the least shew of probability, this book being nothing like a dialogue. This last expositor thinks it probable, that Agur was an inspired author different from Solomon, whose sentences it was thought fit to join with those of this prince, because of the conformity of their matter.

AGURAH, in Jewish antiquity, the name of a silver coin, otherwise called *gerah* and *keshita*.

AGURIUM, or Agyrium (anc. geog.), a town of Sicily in the Val di Demona, near the river Semetus. The people were called *Populus Agyrinensis* by Cicero; *Agyrinus* by Pliny. It was the birth-place of Diodorus Siculus, as he himself testifies; but he calls it *Argyrium*, as it is now called *S. Philippo d'Argirone*, which modern name seems to confirm that *Argyrium* is the true reading.

AGUSADURA, in ancient customs, a fee due from vassals to their lord for the sharpening their ploughing tackle. Anciently the tenants in some manors were not allowed to have their rural implements sharpened by any but whom the lord appointed; for which an acknowledgement was to be paid, called *Agusadura*, in some places *Agusage*: which some take to be the same with what was otherwise called *Reillage*, from the ancient French *reille*, a ploughshare.

AGUTI, in zoology, the trivial name of a species of the mouse, belonging to the mammalia glires of Linnæus. See Mus.

AGYEI, in antiquity, a kind of obelisks, sacred to Apollo, erected in the vestibles of houses, by way of security.

AGYNIANI, in church-history, a sect who condemned all use of flesh, and marriage, as not instituted by God, but introduced at the instigation of the devil. The word is compounded of the privative α and γυνη *woman*. They are sometimes also called *Agynnenses*, and *Agynii*; and are said to have appeared about the year 694. It was no wonder they were of no long continuance. Their tenets coincide in a great measure with those of the Abelians, Gnostics, Cerdonians, and other preachers of chastity and abstinence.

AGYRTÆ, in antiquity, a kind of strolling impostors running about the country, to pick up money by telling fortunes at rich mens doors, pretending to cure diseases by charms, sacrifices, and other religious mysteries; also to expiate the crimes of their deceased ancestors, by virtue of certain odours and fumigations; to torment their enemies, by the use of magical verses and the like. The word is Greek Αγυρται, formed of the verb αγυρω, *I congregate*; alluding to the practice of Charletans, who gather a crowd about them.

Agyrtæ, among the Greeks, amount to the same with *Ærufcatores* among the Latins, and differ not much from Gypsies in Britain.

AHAB, son of Omri king of Israel, succeeded his father A. M. 3086, and surpassed all his predecessors in impiety and wickedness. He married Jezebel the daughter of Ethbaal king of the Zidonians, who introduced the idols of Baal and Astarte among the Israelites, and engaged Ahab in the worship of these false deities. God, being provoked by the sins of Ahab, sent the prophet Elijah to him (1 Kings xvii. 1, *seq.*) who declared to him, that there would be a famine of three years continuance. The dearth having lasted three years, the prophet desired Ahab to gather all the people to mount Carmel, and with them the prophets of Baal: when they were thus assembled, Elijah caused fire to descend from heaven upon his sacrifice, after which he obtained of God that it should rain; and then the earth recovered its former fertility. Six years after this, Ben-hadad king of Syria (chap. (xx.

Ahab. xx.) laid siege to Jerusalem. But God, provoked at this proud Syrian, sent a prophet to Ahab, not only to assure him a victory, but to instruct him likewise in what manner he was to obtain it. Ahab was ordered to review the princes of the provinces, which he found to be a choice company consisting of 232 young men, who were to command the people in Samaria, amounting to about 7000 men: with this small army Ahab was directed to fall upon the great host of the Syrians, and that at noon-day, while Ben-hadad and the 32 kings that accompanied him were drinking and making merry. Ben-hadad having notice that they were marching out of the city, ordered them to be brought before him alive, whatever their designs were: but the young men, followed by this small army, advanced, and killed all that opposed them, such a panic seized the Syrian troops, that they began to fly; and even Ben-hadad himself mounted his horse and fled with his cavalry; which Ahab perceiving, pursued them, killed great numbers of them, and took a considerable booty. After this the prophet came to Ahab, to animate him with fresh courage, and to caution him to keep upon his guard; assuring him, that Ben-hadad would return against him the year following. According to this prediction, at the end of the year he returned and encamped at Aphek, with a resolution to give the Israelites battle. Both armies being ranged in order of battle for seven days successively, at length, upon the seventh day, a battle ensued, wherein the Israelites killed 100,000 of the Syrians, and the rest fled to Aphek; but as they were pressing to get into the city, the walls of Aphek fell upon them and killed 27,000 more. Ben-hadad throwing himself upon the mercy of Ahab, this prince received him into his own chariot, and made an alliance with him. The year following, Ahab desiring to make a kitchen-garden near his palace (chap. xxi.), requested of one Naboth, a citizen of Jezreel, that he would sell him his vineyard; because it lay convenient for him. But being refused, he returned in great discontentment to his house, threw himself upon the bed, turned towards the wall, and would eat nothing. Jezebel his wife coming in, asked the reason of his great concern; of which being informed, she procured the death of Naboth, and Ahab took possession of his vineyard. As he returned from Jezreel to Samaria, the prophet Elijah met him, and said, "Hast thou killed and also taken possession? Now saith the Lord, in the place where dogs licked up the blood of Naboth, shall dogs lick thy blood, even thine. As for Jezebel, of her the Lord spake, saying, "The dogs shall eat Jezebel by the wall of Jezreel." Ahab, hearing these and other denunciations, rent his clothes, put sackcloth upon his flesh, and gave other indications of his sorrow and repentance. But his repentance was neither sincere nor persevering. Two years after these things, Jehoshaphat king of Judah came to Samaria to visit Ahab (chap. xxii.) at a time when he was preparing to attack Ramoth-gilead, which Ben-hadad king of Syria unjustly with-held from him. The king of Israel invited Jehoshaphat to accompany him in his expedition; which that prince agreed to do, but desired that some prophet might first be consulted. Ahab therefore assembled the prophets of Baal, in number about 400; who all concurred in exhorting the king to march resolutely against Ramoth-gilead. But Micaiah being also consulted, at Jehoshaphat's suggestion, prophesied the ruin of Ahab. Upon this, Ahab gave orders to his people to sieze Micaiah, and to carry him to Amon the governor of the city, and to Joash the king's son; telling them in his name, "Put this fellow in prison, and feed him with the bread of affliction, and with the water of affliction, until I come in peace." But Micaiah said, "If thou return at all in peace, the Lord hath not spoken by me." Ahab therefore and Jehoshaphat marched up to Ramoth-gilead; and the king of Israel said unto Jehoshaphat, I will disguise myself, and enter into the battle, but put thou on thy robes:" for he knew that the king of Syria had commanded two and thirty captains that had rule over his chariots, saying, "Fight neither with small nor with great, save only with the king of Israel." These officers therefore having observed that Jehoshaphat was dressed in royal robes, took him for the king of Israel, and fell upon him with great impetuosity: but this prince seeing himself pressed so closely, cried out; and the mistake being discovered, the captains of the king of Syria gave over pursuing him. But one of the Syrian army shot a random arrow which pierced the heart of Ahab. The battle lasted the whole day, and Ahab continued in his chariot with his face turned towards the Syrians. In the mean time, his blood was still issuing from his wound, and falling in his chariot; and towards the evening he died: whereupon proclamation was made by sound of trumpet, that every man should return to his own city and country. The king of Israel being dead was carried to Samaria and buried: but his chariot and the reins of his horses were washed in the fish-pool of Samaria, and the dogs licked his blood, according to the word of the prophet. Such being the end of Ahab; his son Ahaziah succeeded him, in the year of the world 3107.

AHÆTULA, the trivial name of a species of the coluber. See COLUBER.

AHASUERUS, or ARTAXERXES, the husband of Esther; and according to archbishop Usher and F. Calmet, the scripture name for Darius, the son of Hystaspes, king of Persia; though Scaliger will have Xerxes to be the husband of Esther, or the Ahasuerus of scripture; and Dr Prideaux believes him to be Artaxerxes Longimanus. See History of PERSIA.

Ahab ‖ Ahaz. AHAZ, king of Judah, the son of Jotham, remarkable for his vices and impieties. One of his sons he consecrated, by making him pass through and perish by the fire, in honour of the false god Moloch; and he offered sacrifices and incense upon the high places, upon hills, and in groves. Rezin king of Syria and Pekah king of Israel invaded Judea in the beginning of the reign of Ahaz; and having defeated his army and pillaged the country, they laid siege to Jerusalem. When they found that they could not make themselves masters of that city, they divided their army, plundered the country, and made the inhabitants prisoners of war. Rezin and his part of the confederate army marched with all their spoil to Damascus; but Pekah with his division of the army having attacked Ahaz, killed 120,000 men of his army in one battle, and carried away men, women, and children, without distinction, to the number of 200,000. But as they were carrying those captives to Samaria, the prophet Oded, with the principal inhabitants of the city, came out to meet them; and by their remonstraces prevailed with them to set their prisoners at liberty. At the same time, the Philistines and Edomites invaded other parts of his land, killed multitudes of the people, and carried off much booty. In this distressed condition, Ahaz finding no other remedy for his affairs, sent ambassadors to Tiglath-pileser king of the Assyrians; and to engage him to his interest, he stripped the temple and city of all the gold which he could meet with, and sent it as a present. Accordingly Tiglath-pileser marched to the assistance of Ahaz, attacked Rezin and killed him, took his capital Damascus, destroyed it, and removed the inhabitants thereof to Cyrene.

The misfortunes of this prince had no influence to make him better: on the contrary, in the times of his greatest affliction, he sacrificed to the Syrian deities, whom he looked upon as the authors of his calamities, and endeavoured to render propitious to him, by honouring them in this manner. He broke in pieces the vessels of the house of God, shut up the gates of the temple, and erected altars in all parts of Jerusalem. He set up altars likewise in all the cities of Judah, with a design to offer incense on them. At length he died, and was buried in Jerusalem, but not in the sepulchres of the kings of Judah his predecessors; which honour he was deprived of, on account of his iniquitous course of life. Hezekiah his son succeeded him in the year of the world 3278, before Jesus Christ 726.

AHAZIAH, the son and successor of Ahab king of Israel, reigned two years, part alone and part with his father Ahab, who ordained him his associate in the kingdom a year before his death. Ahaziah imitated his father's impieties (1 Kings xxii. 52, seq.), and paid his adoration to Baal and Astarte, the worship of whom had been introduced in Israel by Jezebel his mother. The Moabites, who had been always obedient to the kings of the ten tribes ever since their separation from the kingdom of Judah, revolted after the death of Ahab, and refused to pay the ordinary tribute. Ahaziah had not leisure or power to reduce them (2 Kings i. 1, 2, &c.): for about the same time, having fallen through a lattice from the top of his house, he hurt himself considerably, and sent messengers to Ekron, in order to consult Baalzebub, the god of that place, whether he should recover of the indisposition occasioned by this accident. But the prophet Eljah went to Ahaziah, and declared that he should not recover from his illness; and accordingly he died in the year of the world 3138, and Jehoram his brother succeeded to the crown.

Ahaziah, king of Judah, the son of Jehoram and Athaliah, succeeded his father in the kingdom of Judah in the year of the world 3119. He walked in the ways of Ahab's house, to which he was allied, his mother being of that family. He reigned only one year, being slain by Jehu the son of Nimshi.

AHEAD, a sea-term, signifying further onward than the ship, or at any distance before her, lying immediately on that point of the compass to which her stem is directed. It is used in opposition to *astern*, which expresses the situation of any object behind the ship. See Astern.

AHICCYATLI, in zoology, the Indian name of a serpent resembling the rattle-snake, only it wants the rattles. It is as fatal in the effect of the poison as any known species of serpent.

AHIJAH, the prophet of Shilo. He is thought to be the person who spoke twice to Solomon from God, once while he was building the temple (1 Kings vi. 11.), and which time he promised him his protection; and at another time (*id.* xi. 6.) after his falling into all his irregularities, when God expressed his indignation with great threatnings and reproaches. Ahijah was one of those who wrote the annals or history of this prince (2 Chr. ix. 29.). The same prophet declared to Jeroboam that he would usurp the kingdom (1 Kings ix. 29, &c.), and that two heifers should alienate him from the Lord, meaning the golden calves erected by Jeroboam, one at Dan, the other at Bethel. About the end of Jeroboam's reign, towards the year of the world 3046, Abijah the son of that prince fell sick; upon which Jeroboam sent his wife to this prophet to inquire what would become of the child. The queen therefore went to Ahijah's house in Shilo, disguised: But the prophet, upon hearing the sound of her feet, said, "Come in, thou wife of Jeroboam, why feignest thou thyself to be another? for I am sent to thee with heavy tidings." Then he commanded her to go and tell Jeroboam all the evil that the Lord had declared he would bring upon his house for his impieties; that so soon as she would enter into the city her son Abijah should die, and should be the only one of Jeroboam's house that should come to the grave or receive the honours of a burial. Ahijah in all probability did not long survive the time of this last prophecy; but with the time and manner of his death we are not acquainted.

AHITOPHEL, a native of Gillo, was for some time the counsellor of king David, whom he at length deserted, by joining in the rebellion of Absalom. This prince, upon his being preferred to the crown by the greatest part of the Israelites, sent for Ahitophel from Gillo (2 Sam. xv. 12.) to assist him with his advice in the present state of his affairs: for at that time Ahitophel's counsels were received as the oracles of God himself (chap. xvi. *ult.*). Nothing gave David more uneasiness than this event; and when Hushai his friend came to wait on him and attend him in his flight, he intreated him to return rather to Jerusalem, make a show of offering his services to Absalom, and endeavour to frustrate the prudent measures which should be proposed by Ahitophel. When Absalom was come to Jerusalem, he desired Ahitophel to deliberate with his other counsellors upon the measures which were proper for him to take. Ahitophel advised him in the first place to abuse his father's concubines; so that when his party should understand that he had dishonoured his father in this manner, they might conclude that there were no hopes of a reconciliation, and therefore espouse his interest more resolutely. A tent, therefore, being prepared for this purpose upon the terrass of the kings palace, Absalom, in the sight of all Israel, lay with his father's concubines. The next thing Ahitophel proposed was in the terms following: "Let me now choose out 12,000 men, and I will arise and pursue after David this night, and I will come upon him while he is weary and weak-handed, and I will make him afraid, and all the people that are with him shall flee, and I will smite the king only; and I will bring back all the people unto thee; the man whom thou seekest is as if all returned; so all the people shall be in peace." This advice was very agreeable to Absalom and all the elders of Israel. However, Absalom desired Hushai to be called to have his opinion. Hushai being come, and hearing what advice Ahitophel had given, said, The counsel which Ahitophel has given is not good at this time; what, for the present, in my opinion, may do better, is this: let all Israel be gathered unto thee, form Dan even to Bersheba, as the sand that is by the sea for multitude, and put thyself in the midst of them, and wherever David is, we may fall upon him, and overwhelm him with our numbers, as the dew falleth upon the ground. This last advice being more agreeable to Absalom and all the elders of Israel, was preferred; upon which Ahitophel saddled his ass, went to his house at Gillo, hanged himself, and was buried in the sepulchre of his fathers. He foresaw, without doubt, all that would happen in consequence of Hushai's advice, and was determined to prevent the death which he had deserved, and which David would probably have inflicted on him, as soon as he should be resettled on his throne.

AHMELLA, in botany. See BIDENS.

AHOLIBAH and AHOLAH, are two feigned names made use of by Ezekiel (xxiii. 4.) to denote the two kingdoms of Judah and Samaria. Aholah and Aholibah are represented as two sisters of Egyptian extraction. Aholah stands for Samaria, and Aholibah for Jerusalem. The first signifies a *tent;* and the second, *my tent is in her*. They both prostituted themselves to the Egyptians and Assyrians, in imitating their abominations and idolatries: for which reason they were abandoned to those very people for whom they had shown so passionate and so impure an affection; they were carried into captivity, and reduced to the severest servitude.

AHOUAI, in botany, a synonime and also the trivial name of the species of CERBERA.

A-HULL, in the sea-language, the situation of a ship when all her sails are furled on acount of the violence of the storm, and when having lashed her helm on the lee-side, she lies nearly with her side to the wind and sea, her head being somewhat inclined to the direction of the wind.

AHUN, a town in France, in the Upper Marche and generality of Moulins, and is a royal jurisdiction. It is seated on the river Creuse, near a Benedictine abbey of the same name, eight miles south-east of Gueret, 30 north-east of Lomages, and 55 south-east of Moulins. E. Long. 2. 8. N. Lat. 49. 5.

AHUYS, a town of Sweeden. It is small, but very strong by its situation, and has a good port. It is in the principality of Gothland, in the territory of Bleekingy, near the Baltic sea, about 18 miles from Christianstadt. E. Long. 14. 10. N. Lat. 56. 20.

AI, (anc. geog.) a town in Judea, to the north of Jericho, called Αινα by Josephus, and the inhabitants *Ainatæ*. Joshua having sent a detachment of 3000 men against Ai, God permitted them to be repulsed on account of Achan's sin, who had violated the anathema pronounced against the city of Jericho. But after the expiation of this offence, God commanded Joshua (chap. viii.) to march with the whole army of the Israelites against Ai, and treat this city and the kingdom thereof as he had treated Jericho, with this difference, that he gave the plunder of the town to the people. Joshua sent by night 30,000 men to lie in ambush behind Ai; having first well instructed those who had the command of them in what they were to do; and the next day, early in the morning, he marched against the city with the remainder of his army. The king of Ai perceiving them, sallied hastily out of the town with all his people, and fell upon the forces of the Israelites; who upon the first onset fled, as if they had been under some great terror.

As soon as Joshua saw the enemy all out of the gates, he raised his shield upon the top of a pike, which was the signal given to the ambuscade; whereupon they immediately entered the place, which they found without defence, and set fire to it. The people of Ai perceiving the smoke ascending, were willing to return, but discovered those who had set fire to the city in their rear, while Joshua and those who were with him turning about, fell upon them, and cut them in pieces. The king was taken alive, and afterwards put to death.

The chevalier Folard observes, that Joshua's enterprise on Ai, excepting in some particulars of military art, is very like that of Gibeah, which is scarce any thing more than a copy of it. It would appear, says that writer, by the scripture account, that Joshua was not the author of the stratagem made use of by him: for when God directs himself to Joshua, he says, 'Go 'up against Ai; lay an ambuscade behind the town; I 'have delivered the king and the people of it into thine 'hands:' yet notwithstanding this, God might leave the whole glory of the invention and execution of it to him, as to a great general. 'Joshua arose,' says the sacred author, 'and all the people of war, to go up a-'gainst Ai (verse 3.); and Joshua chose out 30,000 'mighty men of valour, and sent them away by night.' Folard remarks, that there is a manifest contradiction between this verse and the 12th, wherein it is said, that Joshua chose out 500 men, whom he sent to lie in ambush, between Bethel and Ai. How is this to be reconciled? Calmet says, that Masius allows but 5000 men for the ambuscade, and 25,000 for the attack of the city, being persuaded that an army of 600,000 men could only create confusion on this occasion, without any necessity for, or advantage in, such numbers: but the generality of interpreters, continues Calmet, acknowledge two bodies to be placed in ambuscade, both between Bethel and Ai; one of 25,000, and the other of 5000 men.

With regard to the signal Joshua made to that part of his army which lay in ambuscade, the learned Folard embraces the opinion of the Rabbins, who believe what is called the shield to be too small to serve for a signal: hence they make it to be the staff of one of their colours: from this, our author concludes, that the whole colours were used on the occasion; for in the Asiatic style, which is very near the poetic, the part is oftentimes to be taken for the whole.

AJALON, (anc. geog.) a town of the tribe of Dan, one of the Levitical. Another in the tribe of Benjamin, in whose valley Joshua commanded the moon to stand still, being then in her decrease, and con-

consequently to be seen at the same time with the sun.

AJAN, a coast and country of Africa, has the river Quilmanci on the south; the mountains from which that river springs, on the west; Abyssinia, or Ethiopia, and the straight of Babelmandel, on the north; and the eastern, or Indian ocean, on the east. The coast abounds with all necessaries of life, and has plenty of very good horses. The kings of Ajan are often at war with the emperor of the Abyssines; and all the prisoners they take they sell to the merchants of Cambaya, those of Aden, and other Arabs, who come to trade in their harbours, and give them in exchange, coloured cloths, glass-beads, raisins, and dates; for which they also take back, besides slaves, gold and ivory. The whole sea-coast, from Zanguebar to the straight of Babelmandel, is called the coast of Ajan; and a considerable part of it is styled the Desert-coast.

AJAX, the son of Oileus, was one of the principal generals that went to the siege of Troy: he ravished Cassandra the daughter of Priam, even in the temple of Minerva, where she thought to have taken sanctuary. It is said, he made a serpent of fifteen feet long so familiar with him, that it eat at his table, and followed him like a dog. The Locrians had a singular veneration for his memory.

AJAX, the son of Telamon, was, next to Achilles, the most valiant general among the Greeks at the siege of Troy: he commanded the troops of Salamis, and performed many great actions, of which we have an account in the Iliad, in *Dictys Cretensis*, and in the 23d book of Ovid's Metamorphoses. He was so enraged that the arms of Achilles were adjudged to Ulysses, that he immediately became mad. The Greeks paid great honours to him after his death, and erected a magnificent monument to his memory upon the promontory of Rhetium.

AJAX, in antiquity, a furious kind of dance, in use among the Grecians; intended to represent the madness of that hero after his defeat by Ulysses, to whom the Greeks had given the preference in his contest for Achilles's arms. Lucian, in his treatise of Dancing, speaks of dancing the *Ajax*.—There was also an annual feast called *Ajantia*, Αιαντεια, consecrated to that prince, and observed with great solemnity in the island of Salamis, as well as in Attica; where, in memory of the valour of Ajax, a bier was exposed, set out with a complete set of armour.

AJAZZO, a sea-port town of the island of Corsica, in the Mediterranean, with a bishop's see. Long. 26. 35. Lat. 41. 40.

AJEZZO, a sea-port town of Natolia, in the province of Caramania, anciently Silesia, seated on the coast of the Mediterranean, 30 miles north of Antioch and 50 west of Aleppo, where the city of Issus anciently stood, and near which Alexander fought his second battle with Darius. Long. 33. 10. Lat. 37. 0.

AICHSTAT, a town of Germany, in Franconia, and capital of a bishopric of the same name. It is remarkable for a curious piece of workmanship, called the sun of the Holy Sacrament, which is in the church: it is of massy gold, of great weight, and is enriched with 350 diamonds, 1400 pearls, 250 rubies, and other precious stones. This place is moderately large, and seated in a valley on the river Altmul, 10 miles N. of Newburgh, and 37 S. of Nuremberg. E. Lon. 11. 10. N. Lat. 49. 0. The bishopric is 45 miles in length and 17 in breadth; and the bishop is chancellor of the church of Mayence or Mentz.

AICUROUS, a species of parrot. See PSITTACUR.

AID, in a general sense, denotes any kind of assistance given by one person to another.

AID, in law, denotes a petition made in court to call in help from another person who has interest in land, or any other thing contested.

Aid-de-camp, in military affairs, an officer employed to receive and carry the orders of a general.

Aid, *Auxilium*, in ancient customs, a subsidy paid by vassals to their lord on certain occasions. Such were the aid of relief, paid upon the death of the Lord Mesne to his heir; the *aid cheval*, or capital aid, due to the chief lord on several occasons, as, to make his eldest son a knight, to make up a portion for marrying his daughter, &c.

AIDS, in the French customs, certain duties paid on all goods exported or imported into that kingdom.

Court of Aids, in France, a sovereign court established in several cities, which has cognizance of all causes relating to the taxes, gabelles, and aids, imposed on several sorts of commodities, especially wine.

AIDS, in the manege are the same with what some writers call *cherishings*, and used to avoid the necessity of corrections.—The inner heel, inner leg, inner rein, &c. are called *inner aids*; as the outer heel, outer leg, outer rein, &c. are called *outer aids*.

AIDAN, a famous Scottish bishop of Lindisfarne, or Holy Island, in the 7th century, was employed by Oswald king of Northumberland in the conversion of the English, in which he was very successful. He died in 651.

AIGHENEDALE, the name of a liquid measure used in Lancashire, containing seven quarts.

AIGLE, a bailwick in the territory of Romand in Swisserland, consists of mountains and valleys, the principal of which are the Aigle and Bex. Through these is the great road from Vallais into Italy. When you pass by Villeneuve, which is at the head of the lake of Geneva, you enter into a deep valley three miles wide, bordered on one side with The Alps of Swisserland, and on the other with those of Savoy, and crossed by the river Rhone. Six miles from thence you meet with Aigle, a large town, seated on a wide part of the valley, where there are vineyards, fields, and meadows. The governor's castle is on an eminence that overlooks the town, and has a lofty marble tower. This government has nine large parishes; and is divided into four parts, Aigle, Bex, Olon, and Ormont. This last is among the mountains, and joins to Rouegment. It is a double valley, abounding in pasture-land. Ivorna, in the district of Aigle, was in part buried by the fall of a mountain, occasioned by an earthquake in 1584.

AIGLE, a small town, in France, in Upper Normandy, twenty-three miles from D'Evereux, and thirty-eight from Rouen. It is surrounded with walls and ditches, has six gates, three suburbs, and three parishes. It trades in corn, toys, and more particularly in needles and pins, E. Long. 1. 5. N. Lat. 48. 35.

AIGUILLON, a small town in France in the province of Guienne, situated at the conflux of the rivers Garonne and Lot.

AIGUISCE, in heraldry, denotes a cross with its four ends sharpened, but so as to terminate in obtuse angles.—It differs from the cross fitchee, in as much as the latter tapers by degrees to a point, and the former only at the ends.

AILANA, AILATH, or AHELOTH, anciently a town of Arabia Petræa, situated near the Sinus Elanites of the Red Sea. It was also called *Elath*, and *Eloth*, (Stephanus, Strabo, Moses.) The same with *Elana*.

AILE, in law, a writ which lies where a person's grandfather, or great grand-father, being seized of lands, &c. in fee simple, the day that he died, and a stranger abates and enters the same day, and dispossesses the heir of his inheritance.

AILESBURY, AYLESBURY, or ALESBURY, a borough town in Buckinghamshire, consisting of about 400 houses. It consists of several streets, though the houses are not very contiguous: these lie round about the market-place, in the middle of which is a convenient hall, where the sessions are held, and sometimes the assizes for the county. It sends two members to Parliament: has a market on Saturdays: and three fairs for cattle, viz. on the Saturday before Palmsunday, June 14th, and September 25th. It is sixty miles south-east of Buckingham, and forty-four north-west of London. W. Long. 0. 40. N. lat. 51. 40.

AILMER, or ÆTHELMARE, Earl of Cornwall, and Devonshire, in the reign of king Edgar. It is not known of what family he was. His authority and riches were great, and so also in appearance was his piety. He founded the abbey of Cerne, in Dorsetshire; and had so great a veneration for Eadwald, the brother of St Edmund the martyr, who had lived a hermit in that country, near the silver well, as they called it, that, with the assistance of Archbishop Dunstan, he translated his relics to the old church of Cernel. In 1016, when Canute, the son of Suane, invaded England, and found himself stoutly opposed by that valiant Saxon prince Edmund Ironside, the son of Æthelred, the Earl Ailmer, with that arch traitor Eadric Streone, Earl of Mercia, and Earl Algar, joined the Dane against their natural prince, which was one great cause of the Saxons ruin. He did not long survive this; and we find mentioned in history only one son of his, whose name was Æthelward, Earl of Cornwell, who followed his father's maxims, and was properly rewarded for it. For in 1018, Canute reaping the benefit of their treasons, and perceiving that the traitors were no longer useful, he caused the infamous Eadric Streone, and this Earl Æthelward, to be both put to death.

AILRED, or EALRED, abbot of Revesby in Lincolnshire, in the reigns of Stephen and Henry II. He was born in 1109, of a noble family, and educated in Scotland with Henry the son of king David. On his return to England, he became a monk of the Cistertian order, in the monastery of Revesby, of which he afterwards was made Abbot. He died on the 12th of January 1166, aged 57, and was buried in his monastery. "He was (says Leland) in great esteem during his life; celebrated for the miracles wrought after his death; and admitted into the catalogue of saints." He was author of several works; most of which were published by Gilbo the Jesuit at Douay, 1631; part of them may be also found in the *Bibliotheca Cistertiensis* and *Bibliotheca Patrum*. His principal work is the *Speculum charitatis*. Leland, Bale, and Pits, mention several manuscrips which were never published.

AILSA, an insulated rock on the western coast of Scotland, between the shores of Airshire and Cantire. It is two miles in circumference at the base, is accessible only at one place, and rises to a great height in a pyramidical form. A few goats and rabits pick up a subsistence among the short grass and furze; but the importance of the rock consists in the great variety and boundless numbers of birds, by which it is frequented, particularly the gannets or solan-geese, whose young are used at the best tables, and bring a good price. Other birds are caught for their feathers. The rock is rented from the Earl of Cassilis at L.33 *per annum*. The depth of the water around the base is from 7 to 48 fathoms. It is surrounded with excellent banks, well stocked with cod and other white fish.

AINSWORTH (Dr Henry), an eminent nonconformist divine, who, about the year 1590, distinguished himself among the Brownists; which drew upon him such troubles that he was obliged to retire to Holland, and became minister of a church at Amsterdam. His skill in the Hebrew language, and his excellent Annotations on the Holy Scriptures, which are still highly esteemed, gained him great reputation. He also wrote several pieces in defence of the Brownists, and several other works.

AINSWORTH (Robert), born at Woodyale in Lancashire in 1660, was master of a boarding-school at Bethnal-green, from whence he removed to Hackney, and to other places in the neighbourhood of London. After acquiring a moderate fortune, he retired, and lived privately till the time of his death, which happened in 1743. We are indebted to him for the best Latin and English Dictionary extant, he published it in quarto 1736; and in 1752, the fourth edition, under the care of Doctor Ward of Gresham, College, and the Rev. William Younge, was enlarged to two vols folio.

AIR, in natural philosophy, a thin fluid, elastic, transparent, ponderous, compressible, and dilatable body, surrounding the terraqueous globe to a considerable height. See AEROLOGY, ATMOSPHERE, and PNEUMATICS.

Impregnation of Water with Fixed AIR, *and with Sulphureous* AIR. See MINERAL *Waters*.

AIR, in Medicine, &c. makes one of the six non-naturals.—From observations on bleeding in rheumatisms, and after taking cold, it is evident, the air can enter with all its qualities, and vitiate the whole texture of the blood, and other juices.—From the palsies, vertigoes, and other nervous affections caused by damps, mines, &c. it is evident, that air thus qualified can relax and obstruct the whole nervous system. And from the colics, fluxes, coughs, and consumptions produced by damp, moist and nitrous air, it is evident it can corrupt and spoil the noble organs, &c.

Circulation of AIR *in Rooms*. To render the circulation of air sensible, let the air of a room be heated by a strong fire, whilst the air of a contiguous room is cold; then let the door between the two rooms be opened, in which case the hot air of one room being lighter, will pass through the upper part of the opening of the door into the cold room: and, on the contrary, the cold

cold air of the other room being heavier, will paſs into the former room through the lower part of the opening; accordingly, it will be found, that applying a lighted candle at the top, in the middle, and at the lower part of the opening between the two rooms, a ſtrong current of air will appear to paſs from the hot into the cold room near the top; a contrary current of air will appear to paſs from the latter into the former room near the lower part of the ſaid opening; whilſt in the middle there is little or no motion at all, as may be clearly perceived by the direction of the flame of the candle.

It is for the ſame reaſon that when the fire is lighted in a chimney, a ſtrong current of air is occaſioned to enter the room, which may be felt by applying the hand near the key-hole, or other ſuch ſmall openings, if the doors and windows are ſhut; for the air over the fire being heated, becomes lighter, and aſcends into the chimney, conſequently other colder air muſt ſupply its place, which forces its way through all the ſmall openings it can find. Were a room with a fire in it to be perfectly cloſed, excepting the chimney, the air in it would ſoon become unwholeſome for reſpiration, and the fire would be ſoon extinguiſhed, beſides other inconveniences. Hence it appears, that thoſe perſons miſtake who expect to keep the air of a room ſweet and wholeſome, eſpecially for convaleſcents, by accurately ſtopping all the ſmalleſt openings that admit freſh air. When the current of air that enters into a room is on ſome ſide of it where it falls immediately upon the perſons who ſit in the room, then it may be offenſive, eſpecially to delicate conſtitutions. In that caſe, ſuch opening ſhould be cloſed: but at the ſame time another opening ſhould be made for admitting freſh air, in another more convenient part; for a circulation of air, eſpecially in rooms where a fire is kept, is not only ſalutary and uſeful, but is abſolutely neceſſary.

In an ingenious publication, intitled, *A Practical Treatiſe on Chimneys*, there are the following remarks relating to the propereſt method of admitting air into a room, and of expelling the contaminated air. The author, directing to make a vent-hole near the top of the room, in order to expel the heated and contaminated air, "this," ſays he "might be done by means of a ſmall tube opening into the room, either in or near the ceiling; which might either be carried to the top of the building, or be made to communicate with the external air by a ſmall perforation through the wall at the roof of the room; by means of either of which, a proper circulation would be eſtabliſhed, and the foul air be carried off.

"For the fire would no ſooner have warmed any particles of air within the room, than theſe would be greatly expanded, and riſe immediately upwards, ſo as to fill the higher parts of the room with rarefied air; and as other particles would be ſucceſſively heated and rarefied in their turn, by their expanſive force they would preſs upon the ſides of the apartment in every place, ſo as to force the lighteſt particles through the opening left for that purpoſe in the top of the room; by which means the fouleſt air would be gradually drawn off, without deſcending again into the lower regions to the annoyance of the company."

But in order to admit freſh air into the room, "Let," ſays he, "another opening be made in the ceiling of the room, having a communication with a ſmall pipe that ſhould lead from thence either to the outſide of the wall, or to any other part of the building that might be judged more convenient, where it ſhould be bent, and conducted downwards, till it reached the ground; where it ſhould be left open, to communicate with the external air.—In this ſituation the cool external air would be forced in at the lower opening of the tube, and made to aſcend into the apartment in proportion to the quantity that eſcaped towards the higher regions by means of the ventilator. And as that weighty air would no ſooner enter the room, that it would tend towards the floor by its own natural gravity, it would gradually mix with the heated air in its deſcent—become, in ſome meaſure, warmed by that means, and equally diſperſed through the room, ſo as ſlowly and imperceptibly to reach the candles and the company in the room, and ſupply them with a ſufficient quantity of freſh and wholeſome air, without the inconveniences to which the company are ſubjected by the uſual way of admitting freſh air (A). For if it enters near the floor of the apartment, it is hurried along in a rapid undivided ſtream towards the fire-place, and ſtriking upon the legs and inferior parts of the body, affects them with a ſtrong ſenſation of cold. To overcome the effects of this, large fires muſt be kept; by which other parts of the body are warmed to an extraordinary degree, which is productive of moſt of thoſe diſorders that are pernicious to the young, and often prove fatal to the old, during the winter-ſeaſon, in theſe cold regions.

"Thus might our apartments be kept conſtantly, and moderately, and equally warm, at a moderate expence, without endangering our health on the one hand, by reſpiring a confined, ſtagnant, and putrid air, or, on the other hand, by ſubjecting ourſelves to ſuch danger of catching colds, conſumptions, and rheumatic complaints, by being expoſed to ſuch exceedingly unequal

(A) Such readers as have been little accuſtomed to ſpeculations of this ſort, will be at a loſs to comprehend in what manner two holes, both of them in the roof the room, and communicating with the air, without any valve, or other contrivance, for opening or cloſing of themſelves, ſhould yet anſwer the two very oppoſite purpoſes; one, of conſtantly bringing cool air into the room without emitting any warm air—and the other, of as conſtantly emitting warm and admitting no cool air. They will pleaſe to advert, that the one of theſe tubes communicates with the atmoſphere at the bottom of the houſe, and the other towards the top: the opening of the one is beneath the level of the room, that of the other above it. Now, as the air is more denſe at the ſurface of the ground than at any height above it, the warm rarefying air will naturally iſſue at that opening where it meets with leaſt reſiſtance, which muſt invariably be through that which opens to the external air at the greateſt height; and as the cool air will naturally be preſſed into the room by that opening where the air is moſt weighty, this muſt invariably be by that which is neareſt the ſurface of the earth.

Air | Air-gun.

equal degrees of heat and cold, as are unavoidable where our apartments are so open as to admit a ready passage to the external air during the winter-season.

"The reader will easily perceive, that all that has been here said has a reference only to those apartments in cold climates, and rigorous weather, where fire to warm them becomes necessary. In warmer regions, or during the summer-season, there can be no objection to the wheel-ventilator in the window.—It is a simple contrivance, and a safe and effectual mean of preserving the air in our apartments sweet and wholesome at that season.

It is a vulgar error among many people, to believe that fire purifies the contaminated air, by destroying the noxious particles mixed with it; and for this reason they think, that the fire kept in a room where the air is tainted, purifies the room, by rendering the air in it again fit for respiration. Indeed, a fire kept in a room or apartment where the air is tainted, as is the case with hospitals, goals, and the like, does certainly purify the apartment, and the practice is very useful; but this effect is only because the fire promotes the circulation of the air, and dries the dampness of rooms, furniture, &c. so that it is not the infected air that is purified, but is new, fresh, and wholesome air, that by the action of the fire has taken the place of the infected air; which infected air, being rarefied by the heat, has been expelled from the apartment. Fire and combustion in general is so far from purifying contaminated air, that it actually contaminates a prodigious quantity of it in a short time; so that not only a common fire, but even a lighted candle, when kept in a well-closed room, wherein the external air has not a free access, instead of purifying, renders the air of that room noxious.

Instrument for ascertaining the Purity or Wholesomeness of respirable AIR. See EUDIOMETER.

AIR BALLOONS, a general name given to bags of any light substance filled with inflammable air, or other permanently elastic fluid, whose specific gravity is considerably less than that of common atmospheric air. The consequence of their being filled in this manner is, that if they are of any considerable magnitude, they ascend in the air to an amazing height; and will not only ascend in this manner by themselves, but carry up along with them great weights, and continue to rise till they attain an height in which the circumambient air is of the same specific gravity with themselves. In this situation they will either float or be driven in the direction of the wind or current of air in which they are exposed, remaining in these elevated regions till the fluid escapes by the bursting of the bags from the superior elasticity of the fluid, or by its gradual evaporation through the pores of the envelope. The history, principles, &c. of those machines are detailed under the article AEROSTATION.

AIR-Bladder, in fishes. See COMPARATIVE ANATOMY, chap. iii. and ICHTHYOLOGY.

Plate X.

AIR-Gun, a pneumatic machine for exploding bullets, &c. with great violence.

The common air-gun is made of brass, and has two barrels; the inside barrel A, fig. 8. which is of a small bore, from whence the bullets are exploded; and a large barrel ECDR on the outside of it. There is a syringe SMNP fixed in the stock of the gun, by which the air is injected into the cavity between the two barrels through the valve EP. The ball K is put down into its place in the small barrel, with the rammer, as in any other gun. At S L is another valve, which, being opened by the trigger O, permits the air to come behind the bullet, so as to drive it out with great force. If this valve be opened and shut suddenly, one charge of condensed air may be sufficient for several discharges of bullets; but if the whole air be discharged on one single bullet, it will drive it out with a great force. This discharge if effected by means of a lock, fig. 9. placed here as usual in other guns; for the trigger being pulled, the cock will go down and drive the lever O, fig. 8. which will open the valve, and let in the air upon the bullet K.

Air-guns of late years have received very great improvements in their construction. Fig. 10. is a representation of one made by the late Mr B. Martin of London, and now by several of the mathematical instrument and gun-makers of that metropolis. For simplicity and perfection it exceeds any other heretofore contrived. A is the gun-barrel, with the lock, stock, ram-rod, and of the size and weight of a common fowling-piece. Under the lock, at *b*, is a round steel tube, having a small moveable pin in the inside, which is pushed out when the trigger *a* is pulled, by the spring work within the lock; to this tube *b*, a hollow copper-ball *c* screws, perfectly air-tight. This copper-ball is fully charged with condensed air by the syringe B (fig. 7.) previous to its being applied to the tube *b* of fig. 10. It is then evident, that if a bullet be rammed down in the barrel, the copper ball screwed fast at *b*, and the trigger *a* be pulled, that the pin in *b* will, by the action of the spring-work within the lock, forcibly strike out into the copper ball; and thereby pushing in suddenly a *valve* within the copper ball, let out a portion of the condensed air; which air will rush up thro' the aperture of the lock, and forcibly act against the bullet, driving it to the distance of 60 or 70 yards or further. If the air is strongly condensed at every discharge, only a portion of the air escapes from the ball; therefore, by re-cocking the piece, another discharge may be made; and this repeated to the amount of 15 or 16 times. An additional barrel is sometimes made, and applied for the discharge of shot, instead of the one above described.

The air in the copper ball is condensed by means of the syringe B (fig. 7.), in the following manner: The ball *c* is screwed quite close on the top of the syringe at *b*, at the end of the steel pointed rod: *a* is a stout ring through which passes the rod *k*: upon this rod the feet should be firmly set; then the hands are to be applied to the two handles *i i*, fixed on the side of the barrel of the syringe. Now, by moving the barrel B steadily up and down on the rod *a*, the ball *c* will become charged with condensed air; and it may be easily known when the ball is as full as possible, by the irresistible action that the air makes against the piston when you are working the syringe. At the end of the rod *k* is usually a four-square hole, which with the rod serves as a key to fasten the ball *c* fast on the screw *b* of the gun and syringe close to the orifice in the ball *c*. In the inside is fixed a valve and spring, which gives way for the admission of air; but upon its emission comes close up to the orifice, shutting up the internal

Air-gun.

air. The piston-rod works air-tight, by a collar of leather on it, in the barrel B; it is therefore plain, when the barrel is drawn up, the air will rush in at the hole *h*. When the barrel is pushed down, the air therein contained will have no other way to pass from the pressure of the piston but into the ball *c* at top. The barrel being drawn up, the operation is repeated, until the condensation is so strong as to resist the action of the piston.

Sometimes the syringe is applied to the end of the barrel C (see fig. 11.); the lock and trigger shut up in a brass case *d*; and the trigger pulled, or discharge made, by pulling the chain *b*. In this contrivance there is a round chamber for the condensed air at the end of the syringe at *e*, and it has a valve acting in a similar manner to that of the copper ball. When this instrument is not in use, the brass case *d* is made to slide off, and the instrument then becomes a walking-stick; from which circumstance, and the barrel being made of cane, brass, &c. it has received the appellation of the *Air-cane*. The head of the cane unscrews and takes off at *a*, where the extremity of the piston rod in the barrel is shown: an iron rod is placed in a ring at the end of this, and the air condensed in the barrel in a similar manner to that of the gun as above; but its force of action is not near so strong and permanent as that of the latter.

The *Magazine Air-gun* was invented by that ingenious artist L. Colbe. By this contrivance ten bullets are so lodged in a cavity, near the place of discharge, that they may be drawn into the shooting-barrel, and successively discharged so fast as to be nearly of the same use as so many different guns.

Fig. 12. represents the present form of this machine, where part of the stock is cut off, to the end of the injecting syringe. It has its valve opening into the cavity between the barrels, as before. K K is the small shooting-barrel, which receives the bullets from the magazine E D, which is of a serpentine form, and closed at the end D when the bullets are lodged in it. The circular part *a b c*, is the key of a cock, having a cylindric hole through it, *i*, *k*, which is equal to the bore of the same barrel, and makes a part of it in the present situation. When the lock is taken off, the several parts Q, R, T, W. &c. come into view, by which means the discharge is made by pushing up the pin P *p*, which raises and opens a valve V, to let in the air against the bullet I, from the cavity F F; which valve is immediately shut down again by means of a long spring of brass N N. This valve V being a conical piece of brass, ground very true in the part which receives it, will of itself be sufficient to confine the air.

To make a discharge, you will pull the trigger Z Z, which throws up the seer *y a*, and disengages it from the notch *a*, upon which the strong spring W W moves the tumbler T, to which the cock is fixed. This, by its end *u*, bears down the end *v* of the tumbling lever R, which, by the other end *m*, raises at the same time the flat end of the horizontal lever Q; and by this means, of course, the pin P *p*, which stands upon it, is pushed up, and thus opens the valve V, and discharges the bullet. This is all evident from a bare view of the figure.

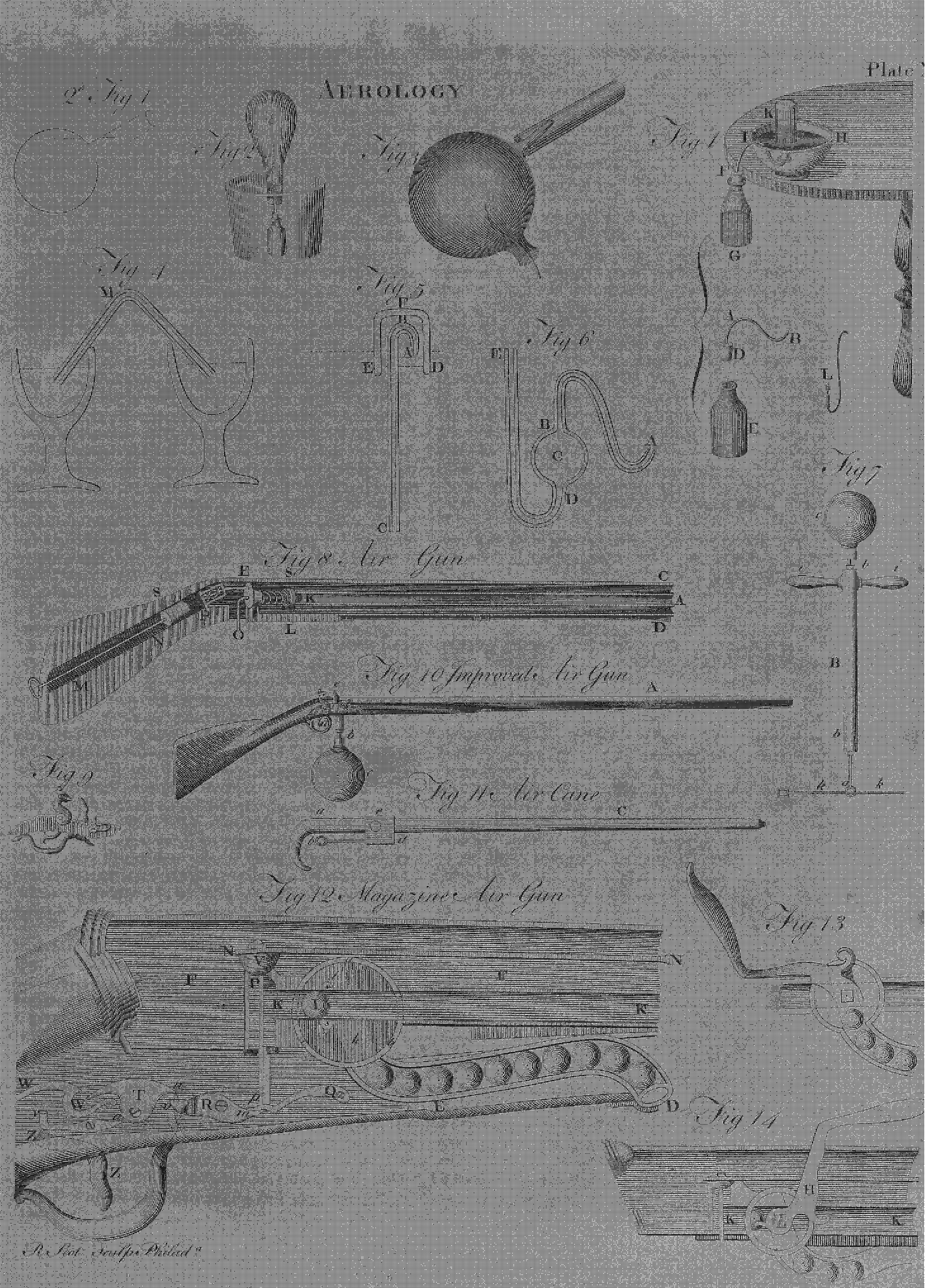
To bring another bullet to succeed that marked I, instantaneously, turn the cylindric cavity of the key of the cock, which before made part of the barrel K K, into the situation *i k*, so that the part *i* may be at K; and hold the gun upon your shoulder, with the barrel downwards and the magazine upwards, by which means that bullet next the cock will fall into it out of the magazine, but go no farther into this cylindric cavity than the two little springs *s s*, which detain it. The two circles represent the cock-barrel, wherein the key abovementioned turns upon an axis not represented here, but visible in fig. 13. This axis is a square piece of steel, on which comes the square hole of the hammer H, fig. 14. by which the cylindric cavity mentioned is opened to the magazine. Then opening the hammer, as in that figure, the bullet is brought into its proper place near the discharge-valve, and the cylindric cavity of the key of the cock again makes part of the inward barrel K K.

It evidently appears how expeditious a method this is of charging and discharging a gun; and were the force of condensed air equal to that of gun-powder, such an air-gun would answer the end of several guns.

In the air-gun, and all other cases where the air is required to be condensed to a very great degree, it will be requisite to have the syringe of a small bore, viz. not exceeding half an inch in diameter; because the pressure against every square inch is about 15 pounds, and therefore against every circular inch about 12 pounds. If therefore the syringe be one inch in diameter, when one atmosphere is injected, there will be a resistance of 12 pounds against the piston; and when 10 are injected, there will be a force of 120 pounds to be overcome; whereas 10 atmospheres act against the circular half-inch piston (whose area is only one-fourth part so big) with only a force equal to 30 pounds; or 40 atmospheres may be injected with such a syringe, as well as 10 with the other. In short, the facility of working will be inversely as the squares of the diameter of the syringe.

Air-Jacket, a sort of jacket made of leather, in which are several bags, or bladders, composed of the same materals, communicating with each other. These are filled with air through a leather tube, having a brass stop-cock accurately ground at the extremity, by which means the air blown in through the tube is confined in the bladders. The jacket must be wet, before the air be blown into the bags, as otherwise it will immediately escape through the pores of the leather. By the help of these bladders, which are placed near the breast, the person is supported in the water, without making the efforts used in swimming.

Air-Pipes, an invention for drawing foul air out of ships, or any other close places, by means of fire. These pipes were first found out by one Mr Sutton, a brewer in London; and from him have got the name of *Sutton's Air pipes*. The principle on which their operation depends is known to every body, being indeed no other than that air is necessary for the support of fire; and, if it has not access from the places most adjacent, will not fail to come from those that are more remote. Thus, in a common furnace, the air enters through the ash-hole; but if this is closed up, and a hole made in the side of the furnace, the air will rush in with great violence through that hole. If a tube of any length whatever is inserted in this hole, the air will rush through the tube into the fire, and of con-


AEROLOGY
Plate X
2. Fig 1
Fig 2
Fig 3
Fig 1
Fig 4
Fig 5
Fig 6
Fig 7
Fig 8 Air Gun
Fig 10 Improved Air Gun
Fig 9
Fig 11 Air Cane
Fig 12 Magazine Air Gun
Fig 13
Fig 14
R. Scot Sculp. Philad.

Air-pipes. consequence there will be a continual circulation of air in that place where the extremity of the tube is laid. Mr Sutton's contrivance then, as communicated to the Royal Society by Doctor Mead, amounts to no more than this.—" As, in every ship of any bulk, there is already provided a copper or boiling-place proportionable to the size of the vessel; it is proposed to clear the bad air, by means of the fire already used under the said coppers or boiling places for the necessary uses of the ship.

" It is well known, that, under every such copper or boiler, there are placed two holes, separated by a grate, the first of which is for the fire, and the other for the ashes falling from the same; and that there is also a flue from the fire-place upward, by which the smoke of the fire is discharged at some convenient place of the ship.

" It is also well known, that the fire once lighted in these fire-places, is only preserved by the constant draught of air through the forementioned two holes and flue; and that if the said two holes are closely stoped up, the fire, though burning ever so briskly before, is immediately put out.

" But if, after shutting the abovementioned holes, another hole be opened, communicating with any other room or airy place, and with the fire: it is clear, the said fire must again be raised and burn as before, there being a like draught of air through the same as there was before the stopping up of the first holes; this case differing only from the former in this, that the air feeding the fire will now be supplied from another place.

" It is therefore proposed, that, in order to clear the holds of ships of the bad air therein contained, the two holes abovementioned, the fire-place and ash-place, be both closed up with substantial and tight iron-doors; and that a copper or leaden pipe, of sufficient size, be laid from the hold into the ash-place, for the draught of air to come in that way to feed the fire. And thus it seems plain, from what has been already said, that there will be, from the hold, a constant discharge of the air therein contained; and consequently, that that air, so discharged, must be as constantly supplied by fresh air down the hatches or such other communications as are opened into the hold; whereby the same must be continually freshened, and its air rendered more wholesome and fit for respiration.

" And if into this principal pipe, so laid into the hold, other pipes are let in, communicating respectively either with the well or lower decks: it must follow, that part of the air, consumed in feeding the fire, must be respectively drawn out of all the places to which the communication shall be so made."

This account is so plain, that no doubt can remain concerning the efficacy of the contrivance; it is evident, that, by means of pipes of this kind, a constant circulation of fresh air would be occasioned thro' those places where it would otherwise be most apt to stagnate and putrefy. Several other contrivances have been used for the same purpose; and Doctor Hale's ventilators, by some unaccountable prejudice, have been reckoned superior in efficacy and even simplicity to Mr. Sutton's machine, which at its first invention met with great opposition*, and even when introduced by Dr Mead, who used all his interest for that purpose, was shamefully neglected.

*See *Sutton*.

Air-pipes. A machine capable of answering the same purpose was invented by Mr Desaguliers, which he called the *ship's lungs*. It consisted of a cylindrical box set up on its edge, and fixed to a wooden pedestal. From the upper edge of the box issued a square trunk open at the end, and communicating with the cavity of the box. Within this box was placed a cylindrical wheel turning on an axis. It was divided into 12 parts, by means of partitions placed like the radii of a circle. These partitions did not extend quite to the centre, but left an open space of about 18 inches diameter in the middle; towards the circumference, they extended as far as possible without interfering with the case, so that the wheel might always be allowed to turn freely.—Things being thus circumstanced, it is plain, that if the wheel was turned towards that side of the box on which the trunk was, every division would push the air before it, and drive it out through the trunk, at the same time that fresh air would come in through the open space at the centre, to supply that which was thrown out thro' the trunk. By turning the wheel swiftly, a strong blast of air would be continually forced out thro' the square trunk, on the same principles on which a common fanner winnows corn. If the wheel is turned the opposite way, a draught of air may be produced from the trunk to the centre. If this machine, then, is placed in a room where a circulation of air is wanted, and the trunk made to pass through one of the walls; by turning the wheel swiftly round, the air will be forced with great velocity out of that room, at the same time that fresh air will enter through any chinks by which it can have access to supply that which has been forced out.

It is evident, that the circulation which is promoted by this machine, is entirely of the same kind with that produced by Mr Sutton's: the turning of the wheel in Mr Desagulier's machine being equivalent to the rarefaction of the air by fire in Mr Sutton's: but that the latter is vastly superior, as acting of itself, and without intermission, requires no argument to prove. Mr Sutton's machine has yet another conveniency, of which no other convenience for the same purpose can boast; namely, that it not only draws out putrid air, but destroys it by causing it pass through fire: and experience has abundantly shown, that though putrid air is thrown into a great quantity of fresh air, it is so far from losing its pernicious properties, that it often produces noxious diseases. We do not say, indeed, that putrid air becomes salutary by this means; but it is undoubtedly rendered less noxious than before; tho' whether it is equally innocent with the smoke of a fire fed in the common way, we cannot pretend to determine.

Besides this machine by Mr Desaguliers, the ventilators of Dr Hales, already mentioned, and those called *wind-sails*, are likewise used for the same purpose. The former of which is an improvement of the Hessian-bellows*: the other is a contrivance for throwing fresh-air into those places where putrid air is apt to lodge; but this has the last-mentioned inconvenience in a much greater degree than any of the others, as the blast of fresh air throws out that which was rendered putrid by stagnation, in such a manner as to contaminate all around it. See Wind-*Sails*.

*See *Ventilator*.

Air-Trunk, is alſo a contrivance by Doctor Hales to prevent the ſtagnation of putrid effluvia in jails, and other places where a great number of people are crowded together in a ſmall ſpace. It conſiſts only of a long ſquare trunk open at both ends; one of which is inſerted into the ceiling of the room, the air of which is required to be kept pure; and the other extends a good way beyond the roof. Through this trunk a continued circulation is carried on; and the reaſon is, that the putrid effluvia which do ſo much miſchief when collected, being much lighter than the pure atmoſphere, ariſe to the top of the room; and, if they there find a vent, will continually go out through it. Theſe effluvia ariſe in very conſiderable quantity, being calculated by the late Dr Keil at no leſs than 39 ounces from one man in 24 hours.

Theſe trunks were firſt made trial of by Mr Yeoman, over the Houſe of Commons, where they were nine inches wide within; and over the Court of King's-bench in Weſtminſter-hall, where they were ſix inches wide. They are ſometimes made wider, and ſometimes narrower: but the wider they are the longer they ought to be, more effectually to promote the aſcent of the vapour. The reaſon why vapours of this kind aſcend more ſwiftly through a long trunk than a ſhort one, is, that the preſſure of fluids is always according to their different depth, without regard to the diameter of their baſis, or of the veſſel which contains them; and, upon this principle, a gallon of water may be made to ſplit a ſtrong caſk. See HYDROSTATICS. When the column of putrid effluvia is long and narrow, the difference between the column of atmoſphere preſſing on the upper end of the trunk, and that which preſſes on the lower end, is much greater than if the column of putrid effluvia was ſhort and wide; and conſequently the aſcent is much ſwifter.—One pan of a ſingle pair of ſcales, which was two inches in diameter, being held within one of theſe trunks over the Houſe of Commons, the force of the aſcending air made it riſe ſo as to require four grains to reſtore the equilibrium, and this when there was no perſon in the houſe; but when it was full, no leſs than 12 grains were requiſite to reſtore the equilibrium; which clearly ſhows that theſe trunks muſt be of real and very great efficacy.

Air-Pump, a machine by which the air contained in a proper veſſel may be exhauſted or drawn out. See the article PNEUMATICS.

Air-Sacks, in birds. See COMPARATIVE ANATOMY, chap. ii.

Air-Shafts, among miners, denote holes or ſhafts let down from the open air to meet the adits and furniſh freſh air. The damps, want, and impurity of air which occur, when adits are wrought 30 or 40 fathoms long, make it neceſſary to let down air-ſhafts, in order to give the air liberty to play through the whole work, and thus diſcharge bad vapours, and furniſh good air for reſpiration: the expence of which ſhafts, in regard of their vaſt depths, hardneſs of the rock, drawing of water, &c. ſometimes equals, nay exceeds, the ordinary charge of the whole adit.

Sir Robert Murray deſcribes a method, uſed in the coal-mines at Liege, of working mines without air-ſhafts.

When the miners at Mendip have ſunk a groove, they will not be at the charge of an air-ſhaft till they come at the ore; and for the ſupply of air have boxes of elm exactly cloſed, of about ſix inches in the clear, by which they carry it down about 20 fathoms. They cut a trench a little diſtance from the top of the groove, covering it with turf and rods diſpoſed to receive the pipe, which they contrive to come in ſideways to their groove, four feet from the top; which carries down the air to a great depth. When they come at ore, and need an air-ſhaft, they ſink it four or five fathoms diſtant, according to the convenience of the breadth, and of the ſame faſhion with the groove, to draw as well ore as air.

Air-Threads, in natural hiſtory, a name given to the long filaments, ſo frequently ſeen in autumn floating about in the air.

Theſe threads are the work of ſpiders, eſpecially of that ſpecies called the long-legged field ſpider; which having mounted to the ſummit of a buſh or tree, darts from its tail ſeveral of theſe threads, till one is produced capable of ſupporting the creature in the air: on this it mounts in queſt of prey, and frequently riſes to a very conſiderable height. See ARANEA.

Air-Vessels, are ſpiral ducts in the leaves, &c. of plants, ſuppoſed to be analogous to the lungs of animals, in ſupplying the different parts of a plant with air. See the article PLANTS.

AIR, in mythology, was adored by the Heathens under the names of Jupiter and Juno; the former repreſenting the ſuperior and finer part of the atmoſpere, and the latter the inferior and groſſer part. The augurs alſo drew preſages from the clouds, thunder, lightning, &c.

AIR, in painting, &c. denotes the manner and very life of action: or it is that which expreſſes the diſpoſition of the agent. It is ſometimes alſo uſed in a ſynonymous ſenſe with geſture or attitude.

AIR, in muſic, is taken in different ſenſes. It is ſometimes contraſted with harmony; and, in this ſenſe it is ſynonymous with melody in general.—Its proper meaning is, A tune which is ſet to words, or to ſhort pieces of poetry that are called *ſongs*.

In operas, we give the name of *air* to ſuch pieces of muſic as are formed with meaſures and cadences, to diſtinguiſh it from the recitative; and, in general, every piece of muſic is called an *air*, which is formed for the voice, or even for inſtruments, and adapted to ſtanzas, whether it forms a whole in itſelf, or whether it can be detached from any whole of which it forms a part, and be executed alone.

If the ſubject admits of harmony, and is ſet in parts, the *air* is, according their number, denominated a *duett*, a *trio*, a *quartetto*, &c. We need not follow Rouſſeau, and the other philologiſts, in their endeavours to inveſtigate the etymon of the word *air*. Its derivation, though found and aſcertained, would contribute little to illuſtrate its meaning in that remote ſenſe, to which, through a long continuance of time, and the various viciſſitudes of language, it has now paſſed. The curious may conſult the ſame article in the *Dictionnaire de Muſique* by M. Rouſſeau.

In modern muſic, there are ſeveral different kinds of *airs*, each of which agrees to a certain kind of dancing, and from theſe dances the airs themſelves take their ſpecific names.

The *airs* of our operas, are, if we may be permitted the

the expression, the canvass or substratum upon which are painted all the pictures of imitative music; melody is the design, and harmony the colouring; every picturesque object selected from the most beautiful parts of nature, every reflected sentiment of the human heart, are the models which the artist imitates; whatever gains attention, whatever interests the soul, whatever charms the ear, or causes emotion in the heart, these are the objects of his imitation. See IMITATION. An air which delights the ear, and discovers the learning of the composer; an air invented by genius, and composed with taste; is the noblest effort of music: it is this which explores the compass, and displays the delicacy, of a beautiful voice; it is in this where the charms of a well-conducted symphony shine; it is by this, that the passions, excited and inflamed by nice gradations, reach and agitate the soul through the avenues of external sense. After hearing a beautiful *air*, the mind is acquiescent and serene: the ear is satisfied, not disgusted: it remains impressed on the fancy, it becomes a part of our essence, we carry it with us, we are able to repeat it at pleasure: without the ability acquired by habit to breathe a single note of it, we execute it in our imagination in the same manner as we heard it upon the theatre: one sees the scene, the actor, the theatre; one hears the accompaniments and the applauses. The real enthusiast in music never forgets the beautiful airs which he has heard; when he chooses, he causes the opera to recommence.

The words to which *airs* are adapted, are not always rehearsed in regular succession, nor spoken in the same manner with those of the recitative; and though, for ordinary, they are very short, yet they are interrupted, repeated, transposed, at the pleasure of the artist. They do not constitute a narrative, which once told is over: they either delineate a picture, which it is necessary to contemplate in different points of view; or inspire a sentiment in which the heart acquiesces with pleasure, and from which it is neither able nor willing to be disengaged; and the different phrases of the *air*, are nothing else but different manners of beholding the same image. This is the reason why the subject of an *air* should be one. It is by these repetitions properly placed, it is by these redoubled efforts, that an impression, which at first was not able to move you, at length shakes your soul, agitates you, transports you out of yourself; and it is likewise upon the same principle, that the runnings, as they are called, or those long, mazy, and inarticulated inflections of the voice, which, in pathetic *airs*, frequently seem, though they are not always so, improperly placed; whilst the heart is affected with a sentiment exquisitely moving, it often expresses its emotions by inarticulate sounds, more strongly and sensibly than it could do by words themselves.

The form of *airs* is of two kinds. The small airs are often composed of two strains, which ought each of them to be sung twice; but the important airs in operas are frequently in the form of rondeaus.

AIR, or *Ayr*, in geography, a town of Scotland, capital of an extensive county of the same name. It stands on the river Air, and was formerly a place of good trade, and seat of fisheries; all of which have vanished, and the people now live by one another. Air appears, from history and other documents, to have been a considerable place at the time of the Norman conquest. The vouchers of its antiquity are corroborated by an elegant building called the *Cross*, which has escaped the destructive rage of the last and preceding century. The date on this fragment of antiquity is 1055, consequently it hath stood in its place above 736 years; and it is to be wished, that the majority of the inhabitants may unite in preserving it from being destroyed by persons who have expressed a strong desire to that purpose. In 1557, the tax levied upon Air was L.236 Scots; upon Glasgow only L.202. In 1771, Air was assessed at 15 s. Sterl. and Glasgow at L. 18, 10s. In 1751, the pickled herrings exported from Air were 6624 barrels; since the year 1777, none. These revolutions appear the more extraordinary, when we consider the very advantageous situation of Air both by land and by water; the fertility of the country; the riches of the sea; its contiguity to the western fisheries on one side, and to Glasgow on the other; the large returns for cattle, grain, and coal; the ample revenues of the town; and particularly the conveniency of its harbour for fishing-vessels of every construction.—About a mile north from the town there is a lazar-house, commonly called *The King's Chapel*, which King Robert de Bruce set apart for the maintenance of lepers.

AIRA, in botany: A genus of the triandria digynia class; and in the natural method ranking under the 4th order, *Gramina*. The characters are: The *calyx* is a two-flowered double-valved glume: The *corolla* is two-valved, and no rudiment of a flower between the florets: The *stamina* consist of three capillary filaments the length of the flower; the antheræ are oblong, and forked at both ends: The *pistillum* is an egg-shaped germen; the styli are two, bristly, and expanding; the stigmata are pubescent: There is no *pericarpium*; the including corolla grows to the seed: The *seed* is egg-shaped and covered. There are 14 species of the aira, nine of which are natives of Britain. The English name is *Hair-grass*. See the general article GRASS.

AIRANI, in church-history, an obscure sect of Arians, in the fourth century, who denied the consubstantiality of the Holy Ghost with the Father and the Son. They are otherwise called *Airanistæ*; and are said to have taken their name from one *Airas*, who distinguished himself at the head of this party, in the reigns of Valentinian and Gratian.

AIRE, a town of France, in Proper Gascony, of which it is the capital, with a bishop's see. It is seated on the river Adour, on the declivity of a mountain. E. Long. 0. 3. N. Lat. 43. 47.

AIRE, a strong town in the Netherlands, in the county of Artois, with a castle. It was taken by the French in 1710, and was confirmed to them by the treaty of Utrecht. It is seated on the River Lis, 22 miles south of Dunkirk, and communicates with St Omer's by a canal cut from the river Aa. E. Long. 2. 31. N. Lat. 50. 38.

AIRING, a term peculiarly used for the exercising horses in the open air. It purifies the blood; purges the body from gross humours; and, as the jockies express it, teaches the horse how to make his wind rake equally, and keep time with the other motions of his body. It also sharpens the stomach, and keeps the creature hungry; which is a thing of great consequence, as hunters and racers are very apt to have their stomach fall off, either from want of exercise, or from the too violent exercise which they are often exposed to. If the horse be over fat, it is best to air him before sun-rise and after sun-setting; and in general, it is allowed by all, that nothing is more beneficial to those creatures than early and late airings. Some of our modern managers, however, dispute this: they say, that the cold of these times is too great for the creature; and that if, in particular, he is subject to catarrhs, rheums, or the like complaints, the dews and cold fogs, in these early and late airings, will be apt to increase all those disorders. Nature, we see, also points out the sun-beams as of great use to these animals; those which are kept hardy and lie out all night, always running to those places where the sunshine comes, as soon as it appears in a morning. This should seem to recommend those airings that are to be made before sun-set, and a little time after sun-rise. As to the caution, so earnestly inculcated by Markham, of using these early and late airings for fat horses, it is found unnecessary by many: for they say, that the same effect may be produced by airings at warmer times, provided only that they are made longer; and that, in general, it is from long airings that we are to expect to bring a horse to a perfect wind and sound courage.

AIRS, in the manege, are the artificial motions of taught horses; as the demivolt, curvet, capriole, &c.

AIRY, or AERY, among sportsmen, a term expressing the nest of a hawk or eagle.

Airy Triplicity among astrologers, denotes the three signs, gemini, libra, and aquarius.

AISNE, a river of France, which rises in Champaign, and runs W. by Soisons in the Isle of France, falling into the river Oise, a little above Campeigne.

AITOCZU, a considerable river of Lesser Asia, which, arising in the mountain Taurus, falls into the south part of the Euxine sea.

AJUGA, BUGLE: A genus of the gymnospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 42d order, *Asperifoliæ*. The characters are: The *calyx* is a short perianthium, monophyllous and persistent: The *corolla* is monopetalous and grinning: The *stamina* consist of four erect subulated filaments; the antheræ are dimidiated: The *pistillum* has a four-cleft germen, a filiform stylus, and two slender stigmata. There is no *pericarpium*; the calyx converging, and containing the seeds in its bosom: The *seeds* are four, and oblong. The *Species* enumerated by Linnæus are, 1. The orientalis, with inverted flowers, which is a native of the east. 2. The genevensis, with woolly leaves and hairy cups, is a native of Swisserland and of the southern parts of Europe. 3. The pyramidalis, or mountain-bugle, with a square pyramidal spike and blue flowers, is a native of Sweden, Germany, Swisserland, and the hilly parts of Britain. Sheep and goats eat it; cows are not fond of it; horses and swine refuse it. 4. The reptans, common or pasture bugle, with creeping suckers, and blue, red, or white blossoms, in long leafy spikes, is a native of the southern parts of Europe, and is met with in woods and moist places in many parts of Britain. The roots are astringent, and strike a black colour with vitriol of iron.

Culture. The first species is propagated by sowing the seeds soon after they are ripe, in a pot filled with loamy earth, and placed in a shady situation till autumn; when it must be removed under a frame, and protected from the frosts. In the spring, after the plants are come up, let them be translated each into a separate pot, and in summer placed under a shady situation. The other sorts are easily propagated by their side-shoots, and succeed best in a moist shady situation.

AIUS LOCUTIUS, the name of a deity to whom the Romans erected an altar.—The words are Latin, and signify "a speaking voice."—The following accident gave occasion to the Romans erecting an altar to the Aius Locutius. One M. Seditius, a plebeian, acquainted the tribunes, that, in walking the streets by night, he had heard a voice over the temple of Vesta, giving the Romans notice that the Gauls were coming against them. This intimation was however neglected; but after the truth was confirmed by the event, Camillus acknowledged this voice to be a new deity, and erected an altar to it under the name of the *Aius Locutius*.

AJUTAGE, or ADJUTAGE, a kind of tube fitted to the mouth of the vessel through which the water of a fountain is to be played. To the different form and structure of ajutages, is owing to the great variety of fountains. See FOUNTAIN and HYDROSTATICS.

AIX, a small but ancient town in the duchy of Savoy, with the title of a marquisate. It is seated on the lake Bourget, at the foot of a mountain, between Chamberry, Annecy, and Rumilley. There is here a triumphal arch of the ancient Romans, but it is almost entirely ruined. The mineral waters bring a great number of strangers to this place. The place was originally called *Aquæ Gratianæ*, from the hot baths built there by the Emperor Gratian. E. Long. 7. 10. N. Lat. 45. 40.

AIX, an ancient city, the capital of Provence, in France. It is an archbishopric; and has a parliament, a court of aids, a chamber of accounts, a seneschal's jurisdiction, a generality, and an university. It has that air of silence and gloom so commonly characteristic of places destitute of commerce or industry: It is, however, a well-built city; and most like Paris of any place in the kingdom, as well for the largeness of the buildings, as in respect of the politeness of the inhabitants. It is embellished with abundance of fine fountains, and several beautiful squares. The preachers square is on the side of a hill; it is about 160 yards in length, and is surrounded with trees, and houses built with stone three stories high. The town-hall is at one end of the city, and is distributed into several fine apartments: the two lowest are taken up by the board of accounts, and by the seneschal; that above is designed for the sessions of parliament. The hall of audience is adorned with the pictures of the kings of France on horseback. The hotel of the city is a handsome building, but hid by the houses of the narrow street in which it is placed. The cathedral church is a Gothic structure, with tombs of several earls of Provence, and some good pictures by French masters. The Corse, or Orbitelle, is a magnificent walk, above 300 yards long, formed by a triple avenue of elms, and two rows of regular and stately houses. The church of the fathers of the oratory is a handsome building; and not far from thence is the chapel of the blue penitents, which is full of paintings. The convent of preachers is very fine; in their church is a silver statue of the Virgin Mary almost as big as the life. There are other churches and

buildings

Aix. buildings which contain a great number of rarities. The baths without the city, which were discovered not long since, have good buildings, raised at a vast expence, for the accommodation of those who drink the waters. Although Aix was the first Roman settlement in Gaul, it is not remarkable for ancient remains. The warm springs from which it is now known and frequented, induced Sextus Calvinus to found a colony here, to which he gave the name of *Aquæ Sextiæ*. They were supposed to possess particular virtues in cases of debility; and several altars have been dug up sacred to Priapus, the inscriptions on which indicate their gratitude to that deity for his supposed succour and assistance. E. Long. 5. 32. N. Lat. 43. 32.

Aix, a small island on the coast of France, between the isle of Oleron and the continent. It is twelve miles north-west of Rochfort, and twelve south-southwest of Rochelle. W. Long 1. 4. N. Lat. 46. 5.

Aix la chapelle, a fine city of Germany, in the circle of Westphalia and duchy of Juliers.

All authors are agreed about its antiquity, it being mentioned in Cæsar's Commentaries and the Annals of Tacitus. The Romans had colonies and fortresses there, when they were at war with the Germans; but the mineral waters and the hot bath so increased its fame, that, in process of time, it was advanced to the privileges of a city, by the name of Aquægranii, that is, the waters of Granius; that which it has now, of *Aix la Chapelle*, was given it by the French, to distinguish it from the other Aix. It is so called, on account of a chapel built in honour of the Holy Virgin by Charlemagne; who having repaired, beautified, and enlarged the city, which was destroyed by the Huns in the reign of Attila, in 451, made it the usual place of his residence. The town is seated in a valley surrounded with mountains and woods, and yet the air is very wholesome. It may be divided into the inward and outward city. The inward is incompassed with a wall about three quarters of a league in circumference, having ten gates; and the outward wall, in which there are eleven gates, is about a league and a half in circumference. There are rivulets which run through the town and keep it very clean, turning several mills; besides twenty public fountains, and many private ones. They have stone-quarries in the neighbourhood, which furnish the inhabitants with proper materials for their magnificent buildings, of which the stadt-house and the cathedral are the chief. There are likewise thirty parochial or collegiate churches. The market-place is very spacious, and the houses round it are stately. In the middle, before the stadt-house, is a fountain of blue stones, which throws out water, from six pipes, into a marble bason placed beneath, thirty feet in circumference. On the top of this fountain, is placed the statue of Charlemagne, of brass, gilt, holding a sceptre in his right-hand, and a globe in his left. The stadt-house is adorned with the statues of all the emperors since Charlemagne. This fabric has three stories, the upper of which is one entire room of 162 feet in length and 60 in breadth. In this the new-elected emperor formerly entertained all the electors of the empire

Aix la chapelle is a free imperial city, and changes its magistracy every year on the eve of St John Baptist. The mayor is in the nomination of the elector palatine, in the quality of the duke of Juliers, as protector of the city. This place is famous for several councils and treaties of peace concluded here; particularly those between France and Spain in 1668, and between Great Britain and France in 1748. Aix.

The hot sulphureous waters for which this place has so long been celebrated, arise from several sources, which supply eight baths constructed in different parts of the town. These waters near the sources are clear and pellucid; and have a strong sulphureous smell resembling the washings of a foul gun; but they loose this smell by exposure to air. Their taste is saline, bitter, and urinous. They do not contain iron. They are also neutral near the fountain, but afterwards are manifestly and pretty strongly alkaline, insomuch that clothes are washed with them without soap.—On the vaults above the springs and aqueducts of these waters is found, every year, when they are opened, a quantity of fine white-coloured flowers of sulphur, which has been sublimed from the waters.

The heat of the water of the hottest spring, by Dr Lucas's account, raises the quicksilver of Fahrenheit's thermometer to 136—by Mons. Monet's account, to 146—and the heat of the fountain, where they commonly drink, by Dr Lucas's account to 112.

Dr Simmons has given the following account of their several temperatures, as repeatedly observed by himself with a thermometer constructed by Nairne.

The spring which supplies the Emperor's bath *(Bain de l'Empereur)*, the New Bath *(Bain Neuf)*, and the Queen of Hungary's bath *(Bain de la Reine de Hongrie)*, - - - -	127°
St Quirin's bath *(Bain de St Quirin)*, -	112°
The Rose bath *(Bain de la Rose)*, and the Poor's bath *(Bain des Pauvres)*, both which are supplied by the same spring, - - - -	112°
Charles's bath *(Bain de Charles)*, and St Corneille's bath *(Bain de St Corneille)*, - -	112°
The spring used for drinking is in the High street, opposite to Charles's bath; the heat of it at the pump is - -	106°

Dr Lucas evaporated the water of the hottest spring (of the Emperor's Bath), and obtained 268 grains of solid matter from a gallon, composed of 15 grains of calcareous earth, 10 grains of selenites, and 243 grains of a saline matter made up of natron and sea salt. They are at first nauseous and harsh, but by habit become familiar and agreeable. At first drinking, also, they generally affect the head. Their general operation is by stool and urine, without griping or diminution of strength; and they also promote perspiration.

The quantity to be drank as an alterative is to be varied according to the constitution and other circumstances of the patient. In general, it is best to begin with a quarter or half a pint in the morning, and increase the dose afterwards to pints, as may be found convenient. The water is best drank at the fountain. When it is required to purge, it should be drank in large and often repeated draughts.

In regard to bathing, this also must be determined by the age, sex, strength, &c. of the patient, and by the season. The degree of heat of the bath should likewise be considered. The tepid ones are in general the best, though there are some cases in which the hotter ones are most proper. But even in these, it is best to begin

begin with the temperate baths, and increase the heat gradually.

These waters are efficacious in diseases proceeding from indigestion and from foulness of the stomach and bowels. In rheumatisms; in the scurvy, scrophula, and diseases of the skin; in hysteric and hypochondriacal disorders; in nervous complaints and melancholy; in the stone and gravel; in paralytic complaints; in those evils which follow an injudicious use of mercury; and in many other cases. They ought not, however, to be given in hectic cases where there is heat and fever, in putrid disorders, or where the blood is dissolved, or the constitution much broken down.

The time of drinking, in the first season, is from the beginning of May till the middle of June; and, in the latter season, from the middle of August to the latter end of September.

There are galleries or piazzas under which the company walk during the time of drinking, in order to promote the operation of the waters.—The poor's bath is free for every body, and is frequented by crowds of poor people.

It is scarcely necessary to add, that there are all kinds of amusements common to other places of public resort; but the sharpers appear more splendid here than elsewhere, assuming titles, with an equipage suitable to them.—Aix la Chapelle is 21 miles from Spa, 36 from Liege, and 30 from Cologne. E. Long. 5. 48. N. Lat. 51. 55.

AIZOON, called by Mr Miller *sempervive*; though the name Aizoon has been by some writers applied to the house-leek, and also to the aloes: A genus of the pentagynia order, belonging to the icosandria class of plants; and in the natural method ranking under the 13th order, *Succulentæ*. The characters are: The *calyx* is a single-leaved perianthium, divided into five segments, and persistent: There is no *corolla*: The *stamina* consist of very numerous capillary filaments: the antheræ are simple: The *pistillum* has a five-cornered germen above, with five simple styli; and the stigmata are simple. The *pericarpium* is a bellied, retuse five-cornered capsule, having five cells and five valves: The *seeds* are many and globular.—Linnæus mentions three species; the canariense, hispanicum, and paniculatum. The first is a native of the Canary islands, the second of Spain, and the third of the Cape of Cood Hope. They may all be raised in Britain on hot-beds; but as they are not remarkable either for beauty or any other property, it appears unnecessary to take further notice of them.

AKENSIDE (Mark), a physician, who published in Latin "A Treatise upon the Dysentery," in 1764, and a few pieces in the first volume of the "Medical Transactions" of the college of physicians, printed in 1768: but far better known, and to be distinguished chiefly hereafter, as a poet. He was born at Newcastle upon-Tyne, November 9. 1721; and after being educated at the grammar-school in Newcastle, was sent to the universities of Edinburgh and Leyden; at which last he took his degree of Doctor in Physic. He was afterwards admitted by mandamus to the same degree at Cambridge; elected a fellow of the college of physicians, and one of the physicians at St Thomas's Hospital; and, upon the establishment of the queen's household, appointed one of the physicians to her majesty.

That Dr Akenside was able to acquire no other kind of celebrity than that of a scholar and a poet, is to be accounted for by the following particulars in his life and conduct, related by Sir John Hawkins.—Mr Dyson and he were fellow-students, the one of law and the other of physic, at Leyden; where, being of congenial tempers, a friendship commenced between them that lasted through their lives. They left the university at the same time, and both settled in London: Mr Dyson took to the bar, and being possessed of a handsome fortune, supported his friend while he was endeavouring to make himself known as a physician; but in a short time, having purchased of Mr Hardinge his place of clerk of the house of commons, he quitted Westminster-hall; and for the purpose of introducing Akenside to acquaintance in an opulent neighbourhood near the town, bought a house at North-End, Hampstead; where they dwelt together during the summer-season, frequenting the long-room, and all clubs and assemblies of the inhabitants.

At these meetings, which, as they were not select, must be supposed to have consisted of such persons as usually meet for the purpose of gossiping, men of wealth, but of ordinary endowments, and able to talk of little else than news, and the occurrences of the day. Akenside was for displaying those talents which had acquired him the reputation he enjoyed in other companies: but here they were of little use to him; on the contrary, they tended to engage him in disputes that betrayed him into a contempt of those that differed in opinion from him. It was found out that he was a man of low birth, and a dependent on Mr Dyson; circumstances that furnished those whom he offended with a ground of reproach, that reduced him to the necessity of asserting in terms that he was a gentleman.

Little could be done at Hampstead after matters had proceeded to this extremity: Mr Dyson parted with his villa at North-End, and settled his friend in a small house in Bloomsbury-square; assigning for his support such a part of his income as enabled him to keep a chariot.—In this new situation Akenside used every endeavour to become popular, but defeated them all, by the high opinion he every where manifested of himself, and the little condescension he showed to men of inferior endowments; by his love of political controversy, his authoritative censure of the public councils, and his bigotted notions respecting government; subjects foreign to his profession, and with which some of the wisest of it have thought it prudent not to concern themselves. In the winter evenings he frequented Tom's coffee-house in Devereux-court, then the resort of some of the most eminent men for learning and ingenuity of the time; with some of whom he became intangled in disputes and altercations, chiefly on subjects of literature and politics, that fixed on his character the stamp of haughtiness and self-conceit, and drew him into disagreeable situations. Hence many, who admired him for his genius and parts, were shy of becoming his intimates.

The value of that precept which exhorts us to live peaceably with all men, or, in other words, to avoid creating enemies, can only be estimated by the reflection on those many amiable qualities against which the neglect of it will preponderate. Akenside was a man of religion and strict virtue; a philosopher, a scholar, and

and a fine poet. His conversation was of the most delightful kind; learned, instructive, and without any affectation of wit, cheerful and entertaining.

Dr Akenside died of a putrid fever, June 23. 1770; and is buried in the parish-church of St James's Westminster.

His poems, published soon after his death in 4to and 8vo, consist of "The pleasures of Imagination," two books of "Odes," a "Hymn to the Niads," and some "Inscriptions," The pleasures of Imagination," his capital work, was first published in 1744; and a very extraordinary production it was from a man who had not reached his 23d year. He was afterwards sensible, however, that it wanted revision and correction; and he went on revising and correcting it for several years: but finding this task to grow upon his hands, and despairing of ever executing it to his own satisfaction, he abandoned the purpose of correcting, and resolved to write the poem over anew upon a somewhat different and enlarged plan. He finished two books of his new poem, a few copies of which were printed for the use of the author and certain friends; of the first book in 1757, of the second in 1765. He finished also a good part of a third book, and an introduction to a fourth; but his most munificent and excellent friend, conceiving all that is executed of the new work, too inconsiderable to supply the place, and supersede the republication of the original poem, and yet too valuable to be with-held from the public, hath caused them both to be inserted in the collection of his poems.

AKIBA, a famous rabin, flourished a little after the destruction of Jerusalem by Titus. He kept the flocks of a rich citizen of Jerusalem till the 40th year of his age, and then applied himself to study in the academies for 24 years; and was afterwards one of the greatest masters in Israel, he having 24,000 scholars. He declared for the impostor Barcochebas, whom he owned for the Messiah; and not only anointed him king, but took upon himself the office of his master of the horse. The troops which the emperor Hadrian sent against the Jews, who under the conduct of this false Messiah had committed horrid massacres, exterminated this faction. Akiba was taken and put to death with great cruelty. He lived 120 years; and was buried with his wife in a cave upon a mountain not far from Tiberias, and his 24,000 scholars were buried round about him upon the same mountain. It is imagined he invented a supposititious work under the name of the patriarch Abraham.

AKISSAT, the ancient Thyatira, a city in Natolia, in Asia, situated in a plain 18 miles broad, which produces plenty of cotton and grain. The inhabitants, who are reckoned to be about 5000, are said to be all Mahometans. The houses are built of nothing but earth or turf dried in the sun, and are very low and ill contrived: but there are six or seven mosques, which are all of marble. There are remarkable inscriptions on marble in several parts of the town, which are part of the ruins of ancient Thyatira. It is seated on the river Hermus, 50 miles from Pergamos. E. Long. 28. 30. N. Lat. 38. 50.

AKOND, an officer of justice in Persia, who takes cognizance of the causes of orphans and widows; of contracts, and other civil concerns. He is the head of the school of law, and gives lectures to all the subaltern officers; he has his deputies in all the courts of the kingdom, who, with the second *sadra*, make all contracts.

AL, an Arabic particle prefixed to words, and signifying much the same with the English particle *the*: Thus they say, alkermes, alkoran, &c. i. e. the kermes, the koran, &c.

AL, or ALD, a Saxon term, frequently prefixed to the names of places, denoting their antiquity; as Alborough, Aldgate, &c.

ALA, a Latin term properly signifying a wing; from a resemblance to which several other things are called by the same name: Thus,

ALA, is a term used by botanists for the hollow of a stalk, which either the leaf, or the pedicle of the leaf, makes with it; or it is that hollow turning, or sinus, placed between the stalk or branch of a plant and the leaf, whence a new offspring usually issues. Sometimes it is used for those parts or leaves otherwise called *lobes* or *wings*.

ALÆ (the plural number) is used to signify those petals or leaves of papilionaceous flowers, placed between those others which are called the *vexillum* and *carina*, and which make the top and bottom of the flowers. Instances of flowers of this structure are seen in those of pease and beans, in which the top leaf or petal is the vexillum, the bottom the carina, and the side ones the alæ.

ALÆ is also used for those extremely slender and membranaceous parts of some seeds, which appear as wings placed on them; it likewise signifies those membranaceous expansions running along the stems of some plants, which are therefore called *alated stalks*.

ALÆ, in anatomy, a term applied to the lobes of the liver, the cartilages of the nostril, &c.

ALÆ, in the Roman art of war, were the two wings or extreme parts of the army drawn up in the order of battle.

ALABA, one of the three smallest districts of Biscay in Spain, but pretty fertile in rye, barley, and fruits. There are in it very good mines of iron, and it had formerly the title of a kingdom.

ALABANDA (anc. geog.), a town in Caria, near the Meander, situate beneath eminences resembling asses with pack-saddles, which gave rise to the jest; and between Amyzo to the west and Stratonice to the east. Under the Romans they enjoyed assises, or a convention of jurisdiction, by Pliny reckoned the fourth in order; hence the proverb in Stephanus, expressing their happiness. It was built by Alabandus, whom therefore they deemed a god. The people were called *Alabandi*, *Alabandenses*, Cicero; and *Alabandeis*, after the Greek manner, in coins of Agustus and Claudius; they were also called *Alabendeni* (Livy).

ALABARCHA, in antiquity, a kind of magistrates among the Jews of Alexandria, whom the emperors allowed them to elect, for the superintendency of their policy, and to decide differences and disputes which arose among them.

ALABASTER (William) an English divine, was born at Hadley in the county of Suffolk. He was one of the doctors of Trinity college in Cambridge; and he attended the earl of Essex as his chaplain in the expedition to Cadiz in the reign of queen Elizabeth. It is is said, that his first resolutions of changing his religion were occasioned by his seeing the pomp of the churches of the Roman communion, and the respect with which the priests seemed to be treated amongst them; and appearing thus to waver in his mind, he soon found persons who took advantages of this disposition of his, and of the complaints which he made of not being advanced according to his deserts in England, in such a manner that he did not scruple to go over to the Popish religion, as soon as he he found that there was no ground to hope for greater encouragement in his own country. However that matter is, he joined himself to the Romish communion, but was disappointed in his expectations. He was soon displeased at this; he could not reconcile himself to the discipline of that church, which made no consideration of the degrees which he had taken before. It is probable too that he could not approve of the worship of creatures, which protestants are used to look upon with horror. Upon this he returned to England, in order to resume his former religion. He obtained a prebend in the cathedral of St Paul, and after that the rectory of Therfield in Hertfordshire. He was well skilled in the Hebrew tongue; but he gave a wrong turn to his genius by studying the Cabala, with which he was strangely infatuated. He gave a proof of this in a sermon which he preached upon taking his degree of doctor of divinity at Cambridge. He took for his text the beginning of the first book of Chronicles, Adam, Seth, Enos; and having touched upon the literal sense, he turned immediately to the mystical, asserting, that Adam signifyed misfortune and misery, and so of the rest. His verses were greatly esteemed. He wrote a Latin tragedy, intitled *Roxana*; which, when it was acted in a college at Cambridge, was attended with a very remarkable accident. There was a lady who was so terrified at the last word of the tragedy, *Sequar, Sequar*, which was pronounced with a very shocking tone, that she lost her senses all her lifetime after. Alabaster was living in 1630. His *Apparatus in Revelationem Jesu Christi* was printed at Antwerp, in 1607. As for his *Spiraculum tubarum seu fons Spiritualium Expositionum ex æquivocis Pentaglotti significationibus*, and his *Ecce Sponsus venit, seu tuba pulchritudinis, hoc est demonstratio quod non sit illicitum nec impossibile computare durationem mundi & tempus secundi adventus Christi*, they were printed at London. We may judge from these titles what the taste and genius of the author was.

Alabaster, in natural history, a species of that genus of stones whose base is calcareous earth. It differs from the marble in being combined, not with the aërial, but with vitriolic acid; therefore, when mixed with any acid; no effervescence appears. It is soluble in about 500 times its weight of water at the temperature of 60. It is fusible alone in a long-continued porcelain heat, or by the blow-pipe. Specific gravity 1.87. Texture granular, with shining particles. In composition, and consequently in its chemical properties, it does not differ from gypsum, selenite, and plaster of Paris.

There are three species of alabaster. 1. The snow-white shining alabaster, or lygdinum of the ancients, is found in Taurus, in pieces large enough to make dishes, or the like. It cuts very freely, and is capable of a fine polish. 2. The yellowish alabaster, or phengites of Pliny, is found in Greece; and is of a soft loose open texture, pretty heavy, and nearly of the colour of honey. This species has likewise been found in Germany, France, and in Derbyshire in England. 3. Variegated, yellow, and reddish alabaster. This species is the common alabaster of the ancients, and is so soft that it may be cut with a knife: It is remarkably bright, and almost transparent; admits of a fine polish, and consists of large angular sparry concretions. It is not proof against water; it ferments violently with aqua-fortis, and burns to a pale yellow. The colour of this species is a clear pale yellow resembling amber, and variegated with undulated veins; some of which are pale red, others whitish, and others of a pale brown. It was formerly brought from Egypt, but is now to be met with in several parts of England. The alabasters are frequently used by statuaries for small statues, vases, and columns. After being calcined and mixed with water, they may be cast in any mould like plaster of Paris. See Gypsum.

Alabaster, Mr Boyle observes, being finely powdered, and thus set in a bason over the fire, will, when hot, assume the appearance of a fluid, by rolling in waves, yielding to the smallest touch, and emitting vapour; all which properties it loses again on the departure of the heat, and discovers itself a mere incoherent powder. The fineness and clearness of this stone renders it in some measure transparent; whence it has been sometimes also employed for windows. There is a church at Florence still illuminated by alabaster-windows; instead of panes of glass, there are slabs of alabaster near 15 feet high, each of which forms a single window, through which the light is conveyed. The countries in Europe which abound most in alabaster are Germany, toward Coblentz; the province of Maconnois, in the neighbourhood of Cluni in France; Italy, toward Rome; where that of Montaiout is particularly remarkable not only for its whiteness, but also for the bigness of its blocks, some of which are so large, that statues as big as the life may easily be cut out of them. F. Labat, in his journey to Italy, observes, that there are quarries of alabaster in the neighbourhood of the village called de la Toffa, near Civita Vecchia: there is also alabaster to be found in some places of Lorrain; but it is not much esteemed. A new manufacture of basso relievos, from a singular species of factitious alabaster, has been some time ago established by M. Letapie, at the baths of St Philip in Tuscany. The stream at these baths deposites a peculiar kind of sand, which, when collected and condensed in the cavities of any body employed to oppose its current, acquires the nature, hardness, and colour of alabaster, and assumes the forms of those cavities in which it is thus lodged.

Alabaster, in antiquity, a term used for a vase wherein odoriferous liquors were anciently put. The reason of the denomination is, that vessels for this purpose were frequently made of alabaster-stone, which Pliny and other ancients represent as peculiarly proper for this purpose. Several critics will have the box mentioned in the Gospels as made of alabaster to have been of glass: And though the text says that the woman broke it, yet the pieces seem miraculously to have been united, since we are told the entire box was purchased by the emperor Constantine, and preserved as a relic of great price. Others will have it, that the name *alabaster* denotes the form rather than the matter of this box: In this view they define alabaster by a box without a handle, deriving the word from the privative α, and λαϐη, *ansa, handle*.

Alabaster is also said to have been used for an ancient liquid measure, containing ten ounces of wine, or nine of oil. In this sense, the alabaster was equal to half the sextary.

ALABASTRUM DENDROIDE, a kind of laminated alabaster, beautifully variegated with the figures of shrubs, trees, &c. found in great abundance in the province of Hohenstein.

ALADINISTS, a sect among the Mahometans, answering to free-thinkers among us.

ALADULIA, a considerable province of Turkey, in Asia, in that part called Natolia, between the mountains of Antitaurus, which separate it from Amasia, on the north, and from Carimania on the west. It has the Mediterranean sea on the south; and the Euphrates, or Frat, on the east, which divides it from Diarbeker. It comprehends the lesser Armenia of the ancients, and the east part of Cilicia. Formerly it had kings of its own; but the head of the last king was cut off by Selim I. emperor of the Turks, who had conquered the country. It is now divided into two parts: the north, comprehended between Taurus, Antitaurus, and the Euphrates, is a beglerbeglic, which bears the name of Marash, the capital town; and the south, seated between mount Taurus and the Mediterranean, is united to the beglerbeglic of Aleppo. The country is rough, ragged, and mountainous; yet there are good pastures, and plenty of horses and camels. The people are hardy and thievish. The capital is Malatigah.

ALAIN (Chartier), secretary to Charles VII. king of France, born in the year 1386. He was the author of several works in prose and verse; but his most famous performance was his Chronicle of king Charles VII. Bernard de Girard, in his preface to the History of France, styles him "an excellent historian, who has given an account of all the affairs, particulars, ceremonies, speeches, answers, and circumstances, at which he was present himself, or had information of." Giles Coroxet tells us, that Margaret daughter to the king of Scotland, and wife to the dauphin, passing once through a hall where Alain lay asleep, she stopped and kissed him before all the company who attended: some of them telling her, that it was strange she should kiss a man who had so few charms in his person, she replied, "I did not kiss the man, but the mouth from whence proceed so many excellent sayings, so many wise discourses, and so many elegant expressions." Mr Fontenelle, among his Dialogues of the Dead, has one upon this incident, between the princess Margaret and Plato. Mr. Pasquier compares Alain to Seneca, on account of the great number of beautiful sentences interspersed throughout his writings.

ALAIS, a considerable town of France, in the province of Languedoc, situated on the river Gardon, at the foot of the Cevennes. The Jesuits had a college in this place; and a fort was built here in 1689. It is 34 miles north of Montpellier, and 340 from Paris. E. Lon. 4. 20. N. Lat. 44. 8.

ALAMANDUS (Lewis), in French *Aleman*, archbishop of Arles, and cardinal of St Cecilia, was one of the greatest men of the fifteenth century. The cardinal presided in the council of Basil, which deposed Eugenius IV. and elected the antipope Felix V. He is much commended by Æneas Sylvius, as a man extremely well formed for presiding in such assemblies, firm and vigorous, illustrious by his virtue, learned, and of an admirable memory in recapitulating all that the orators and disputants had said. One day, when he harangued against the superiority of the pope over the council, he distinguished himself in such an eminent manner, that several persons went to kiss him, while others pressed even to kiss his robe. They extolled to the skies his abilities and genius, which had raised him, though a Frenchman, to a superiority over the Italians, notwithstanding all their natural subtlety and finesse. There is no need of asking, whether pope Eugenius thundered against the president of a council which deposed him. He deprived him of all his dignities, and treated him as a son of iniquity. However, notwithstanding this, Lewis Alamandus died in the odour of sanctity, and performed so many miracles after his death, that at the request of the canons and Celestine monks of Avignon, and the solicitation of the cardinal of Clermont legate *a latere* of Clement VII. he was beatified by that pope in the year 1527.

ALAMANNI (Lewis) was born at Florence, of a noble family, on the 28th of October 1495. He was obliged to fly his country for a conspiracy against Julius de Medici, who was soon after chosen pope under the name of Clement VII. During this voluntary banishment, he went into France; where Francis I. from a love to his genius and merit, became his patron. This prince employed him in several important affairs, and honoured him with the collar of the order of St Michael. About the year 1540, he was admitted a member of the Inflammati, an academy newly erected at Padua, chiefly by Daniel Barbaro and Ugolin Martelli. After the death of Francis, Henry duke of Orleans, who succeeded him in 1547, shewed no less favour to Alamanni; and in the year 1551, sent him as his ambassador to Genoa: this was his last journey to Italy; and being returned to France, he died at Amboise on the 18th of April 1556, being in the 61st year of his age. He left many beautiful poems, and other valuable performances, in the Italian language. We have also some notes of his upon Homer's Iliad and Odyssey; those upon the Iliad were printed in the Cambridge edition of Homer in 1689, and Joshua Barnes has also inserted them in his fine edition of Homer in 1711.

ALAMODALITY, in a general sense, is the accommodating a person's behaviour, dress, and actions, to the prevailing taste of the country or times in which he lives.

ALAMODALITY of writing, is defined the accommodation of mental productions, both as to the choice of subject and the manner of treating it, to the genius or taste of the times, in order to render them more acceptable to the readers.

ALAMODE, a phrase originally French, importing a thing to be in the fashion or mode. The phrase has been adopted not only into several of the living languages, as the English and High-Dutch, but some have even taken it into the Latin. Hence we meet with *Alamodicus* and *Alamodalitas*.

ALAMODE, in commerce, a thin glossy black silk, chiefly used for womens hoods and mens mourning scarfs.

ALAMOS (Balthasar), a Spanish writer, born at Medina del Campo in Castile. After having studied the law at Salamanca, he entered into the service of Anthony Perez, secretary of state under Philip II. He was in high esteem and confidence with his master, upon which account he was imprisoned after the disgrace of this minister. He was kept in confinement 11 years when Philip III. coming to the throne, set him at liberty, according to the orders given by his father in his will. Alamos continued in a private capacity, till the duke of Olivarez, the favourite of Philip IV. called him to public employments. He was a man of wit as well as judgment, but his pen was superior to his tongue. He died in the 88th year of his age. His Spanish translation of Tacitus, and the aphorisms which he added in the margin, gained him great reputation. This work was published at Madrid in 1614; and was to have been followed, as mentioned in the king's privilege, with a commentary, which however has never yet appeared. The author composed the whole during his imprisonment.

ALAN (Cardinal William), was born at Rossal in Lancashire, in the year 1532. He went to Oxford at the age of 15, and in 1550 was elected fellow of Oriel college. In 1556, being then only 24 years old, he was chosen principal of St Mary's hall, and one of the proctors of the university. In 1558 he was made canon of York; but, upon queen Elizabeth's accession to the throne, he left England, and settled at Louvain in an English college, of which he became the chief support. In 1565 he visited his native country; but, on account of his extreme activity in the propagation of the Roman Catholic religion, he was obliged to fly the kingdom in 1568. He went first to Mechlin, and then to Doway, where he was made doctor of divinity. Soon after, he was appointed canon of Cambray, and then canon of Rheims. He was created cardinal on the 28th of July 1587, by the title of *St Martin in Montibus*; and obtained from the king of Spain a rich abbey in the kingdom of Naples, and afterwards the bishopric of Mechlin. It is supposed to have been by the advice and instigation of this priest, that Philip II. attempted to invade England. He died on the 20th of October 1594, aged 63; and was buried in the English college at Rome. He was a man of considerable learning, and an elegant writer. He wrote many books in defence of the Romish religion. The most remarkable are, 1. *A defence of the 12 martyrs in one year*. Tho. Alfield was hanged for bringing, and publishing, this and other of Alan's works, into England, in the year 1584. 2. *A declaration of the sentence of Sextus V.* &c. A work intended to explain the pope's bull for the excommunication of queen Elizabeth, and to exhort the people of England to take up arms in favour of the Spaniards. Many thousand copies of this book, printed at Antwerp, were put on board the armada; but the enterprise failing, they were afterwards destroyed. 3. *Of the worship due to saints and their relicts*, 1583. This treatise was answered by lord Burleigh, and is esteemed the most elegant of the cardinal's writings.

ALAND, an island of the Baltic sea, between Sweden and Finland, subject to the former. It lies between 17 and 19 degrees of E. long. and between 59 and 61 degrees of Lat. at the entrance of the gulph of Bothnia.

ALARAF, in the Mahometan theology, the partition wall that separates heaven from hell. The word is plural, and properly written *al araf*; in the singular it is written *al arf*. It is derived from the Arabic verb *arafa*, to distinguish. Al araf gives the denomination to the seventh chapter of the alcoran, wherein mention is made of this wall. Mahomet seems to have copied his al araf, either from the great gulf of separation mentioned in the New Testament, or from the Jewish writers, who also speak of a thin wall dividing heaven from hell. Mahometan writers differ extremely as to the persons who are to be found on al araf. Some take it for a sort of limbus for the patriarchs, prophets, &c. others place here such whose good and evil works so exactly balance each other, that they deserve neither reward nor punishment. Others imagine this intermediate space to be possessed by those who, going to war without their parents leave, and suffering martyrdom there, are excluded paradise for their disobedience, yet escape hell because they are martyrs.

ALARBES, a name given to those Arabians who live in tents, and distinguish themselves by their dress from the others who live in towns.

ALARES, in Roman antiquity, an epithet given to the cavalry, on account of their being placed in the two wings of the army.

ALARIC, a famous general of the Goths. He entered Thrace at the head of 200,000 men, and laid waste all the country through which he passed. He marched next to Macedonia and Thessaly: the Thessalians met him near the mouth of the river Peneas, and killed about 3000 of his army; nevertheless he advanced into Greece, and after having ravaged the whole country, returned to Epirus, loaded with immense spoils: after staying here five years, he resolved to turn his arms to the west. He marched through Pannonia; and, finding little resistance, entered Italy, under the consulship of Stilicho and Aurelianus, A.D. 400. After various battles and treaties, he at last took Rome by treachery, and permitted his soldiers to plunder it; this happened A. D. 409. Alaric, having laid waste a great part of Italy, intended to pass into Sicily; but a storm obliging him to land again, he besieged the city of Cosenza; and having taken it, he died there in 411, eleven years after he first entered Italy.

ALARM, in the military art, denotes either the apprehension of being suddenly attacked; or the notice thereof, signified by firing a cannon, firelock, or the like. False alarms are frequently made use of to harrass the enemy, by keeping them constantly under arms. Sometimes also this method is taken to try the vigilance of the piquet-guard, and what might be expected from them in case of real danger.

Alarm-Bell, that rung upon any sudden emergency, as a fire, mutiny, or the like.

Alarm-Post, or *alarm-place*, the ground for drawing up each regiment in case of an alarm. This is otherwise called *the rendezvous*.

Alarm, in fencing, is the same with what is otherwise called an appeal, or challenge.

ALASCANI, in church-history, a sect of Antilutherans,

therans, whose distinguishing tenet, besides their denying baptism, is said to have been this, that the words, *This is my body*, in the institution of the eucharist, are not to be understood of the bread, but of the whole action, or celebration of the supper. They are said to have taken the name from one Joannes a Lasco, a Polish baron, superintendant of the church of that country, in England. See the next article.

ALASCO (John), a Polish nobleman of the 16th century, who, imbibing the reformed opinions, was expelled his country, and became preacher to a Protestant congregation at Embden; but foreseeing persecution there, came to England about the year 1551, while the reformation was carrying on under Edward the VI. The publication of the Interim driving the Protestants to such places as afforded them toleration, 380 were naturalized in England, and obtained a charter of incorporation, by which they were erected into an ecclesiastical establishment, independent on the church of England. The Augustine friars church was granted them, with the revenues, for the maintenance of Alasco as superintendant, with four assistant ministers, who were to be approved by the king: and this congregation lived undisturbed until the accession of Queen Mary, when they were all sent away. They were kindly received and permitted to settle at Embden; and Alasco at last, after an absence of 20 years, by the favour of Sigismund, returned to his own country, where he died in 1560. Alasco was much esteemed by Erasmus, and the historians of his time speak greatly in his praise: we have of his writing, *De Cœna Domini liber; Epistola continens summam Controversiæ de Cœna Domini, &c.* He had some particular tenets; and his followers are called *Alascani* in church-history.

ALATAMAHA, a large river of North America, which, rising in the Apalachian mountains, runs south-east through the state of Georgia, and falls into the Atlantic ocean, below the town of Frederica.

ALATERNUS, in botany, the trivial name of a species of the rhamnus. See RHAMNUS.

ALAVA, a district of Spain, about 20 miles in length, and 17 in breadth, containing very good iron mines. Victoria is the capital town.

ALAUDA, or LARK, in ornithology, a genus of birds of the order of passeres; the characters of which are these: The beak is cylindrical, subulated, straight; and the two mandibles or chaps are of equal size. The tongue is bifid, and the hinder claw is straight, and longer than the toe. There are 28 species of the alauda, of which the following are the most remarkable. 1. The arvensis, or common sky-lark. This and the wood-lark are the only birds that sing as they fly; this raising its note as it soars, and lowering it till it quite dies away as it descends. It will often soar to such a height, that we are charmed with the music when we lose sight of the songster; it also begins its song before the earliest dawn. Milton, in his Allegro, most beautifully expresses these circumstances; and bishop Newton observes, that the beautiful scene that Milton exhibits of rural cheerfulness, at the same time gives us a fine picture of the regularity of his life, and the innocency of his own mind: thus he describes himself as in a situation

To hear the lark begin his flight,
And singing startle the dull night,
From his watch-tow'r in the skies,
Till the dappled dawn doth rise.

It continues its harmony several months, beginning early in the spring, on pairing. In the winter they assemble in vast flocks, grow very fat, and are taken in great numbers for the tables. They build their nest on the ground, beneath some clod, forming it of hay, dry fibres, &c. and lay four or five eggs.—These birds are taken in great quantities in the neighbourhood of Dunstable in England: the season begins about the 14th of September, and ends the 25th of February; and during that space, about 4000 dozen are are caught, which supply the markets of the metropolis of that kingdom. See BIRD-*Catching*. Vastly greater numbers than the above, however, are at times caught in different parts of Germany, where there is an excise upon them. Keysler says, that the excise alone produces 6000 dollars every year to the city of Leipsic; whose larks are famous all over Germany as having the most delicate flavour. But it is not at Leipsic only that they are taken in such numbers, but also in the country about Naumburg, Merseburg, Halle, and other parts.—2. The pratensis, or tit-lark, has the two outward feathers of the wing edged with white, and frequents the meadows. It is found frequently in low marshy grounds: like other larks, it builds its nest among the grass, and lays five or six eggs. Like the wood-lark, it sits on trees; and has a most remarkable fine note, singing in all situations, on trees, on the ground, while it is sporting in the air, and particularly in its descent. This bird, with many others, such as the thrush, black-bird, willow-wren, &c. become silent about midsummer, and resume their notes in September: hence the interval is the most mute of the year's three vocal seasons, spring, summer, and autumn. Perhaps the birds are induced to sing again as the autumnal temperament resembles the vernal.—3. The arborea, or wood-lark, is a native of Europe, and is distinguished by an annular white fillet about the head. It is inferior in size to the sky-lark, and is of a shorter thicker form; the colours are paler, and its note is less sonorous and less varied, though not less sweet. It perches on trees, and whistles like the black-bird. It will sing in the night; and, like the common lark, will sing as it flies. It builds on the ground, and makes its nest on the outside with moss, within of dried bents, lined with a few hairs. It lays five eggs, dusky and blotched with deep brown marks, darkest at the thicker end. The males of this and the last are known from the females by their superior size. But this species is not near so numerous as that of the common kind.—4. The campestris, has one half of its chief feathers of the wings brown, except two in the middle which are white, and the throat and breast are yellowish.—5. The trivialis, whose chief feathers on the tail are brown, only half of the outermost is white, and the second is white at the end, in the shape of a wedge; there is likewise a double whitish line on the wings. It is a native of Sweden, and perches on the top of trees.—6. The cristata: the chief tail-feathers are black, but the two outermost are edged with white, and the head is crested. It is a native of Europe. It sings well, like the sky-lark; lays four or five eggs; and is said to hatch twice in a year.—7. The spinoletta: the chief tail-feathers are black, only

only the outermost two are obliquely half white. It is a native of Italy.—8. The alpestris: the chief wing-feathers are half white, the throat yellow, and it has a black streak under the eyes and on the breast. It inhabits North America, where it is migratory. It visits the neighbourhood of Albany the beginning of May, but goes farther north to breed. In winter it comes in vast flocks into Virginia and Carolina, returning North in spring. It feeds, during its stay in the more southern parts, on oats and other grain; and while at Albany, on the grass and the buds of sprig-birch. It runs into holes; whence the natives of these last parts have given it the name of *chi-chup-pi-sue*. The English call it the *ortalon*, and reckon it delicious eating. By some it is called *snow-bird*, as being very plenty in that season. It is frequently caught in great numbers by means of horse-hair springs placed in some bare place, the snow being scraped away, and a little chaff strewed about. It is always seen on the ground, and has little or no song. This bird is not peculiar to North America: we here of it in Germany also; and is in plenty throughout Russia and Siberia, going northward in spring.—9. The magna, is yellow on the belly, with a crooked black streak on the breast, and the three side-feathers of the tail white. It is a native of Africa and America.—10. The New Zealand lark (Plate XVIII.) is seven and a half inches in length: the bill is half an inch, of a pale ash-colour, with the upper part black: the upper parts of the body are dusky, edged with pale ash-colour: the breast and belly are white: the legs reddish ash-colour, and the claws black. It inhabits Charlotte Sound, and is called *kogoo aroúre*.

ALAUTA, a considerable river of Turkey in Europe, which, after watering the north-east part of Transylvania and part of Wallachia, falls into the Danube almost opposite to Nicopolis.

ALAY, signifying in the Turkish language "The Triumph," a ceremony which accompanies the assembling together the forces of that vast empire upon the breaking out of a war. It consists of the most insipid buffoonery, and is attended with acts of the most shocking barbarity. That which took place upon occasion of the late war between the Porte and Russia is described by Baron Tott in his Memoirs as follows.

"It consists in a kind of Masquerade, in which each trade successively presents to the spectators the mechanical excercise of its respective art. The labourer draws his plough, the weaver handles his shuttle, the joiner his plain; and these different characters, seated in cars richly ornamented, commence the procession, and precede the standar of Mahomet, when it is brought out of the seraglio to be carried to the army, in order to insure victory to the Ottoman troops.

"This banner of the Turks, which they name *Sandjak-Cheriff*, or the Standard of the Prophet, is so revered among them, that, notwithstanding its reputation has been so often tarnished, it still retains their implicit confidence, and is the sacred signal unto which they rally. Every thing proclaims its sanctity. None but the emirs are allowed to touch it; they are its guards, and it is carried by their chief. The Mussulmen alone are permitted to look upon it. If touched by other hands, it would be defiled; if seen by other eyes, profaned. In short, it is encompassed by the most barbarous fanaticism.

"A long peace had unfortunately caused the ridiculousness, and especially the danger of this ceremony to be forgotten. The Christians imprudently crowded to see it; and the Turks, who, by the situation of their houses, could make money of their windows, began to profit by the advantage; when an emir, who preceded the banner, proclaimed with a loud voice, 'Let no infidel dare to profane with his presence the holy standard of the prophet; and let every Mussulman who perceives an unbeliever make it known under pain of reprobation.'

"From that moment no asylum was to be found; even those became informers, who, by letting out their houses, had rendered themselves accomplices in the crime. A religious fury seized on every mind, and put arms in every hand; the more atrocious the cruelty, the more was it meritorious. No regard was paid to sex or age; pregnant women, dragged by the hair, and trodden under feet by the multitude, perished in the most deplorable manner. Nothing was respected by these monsters; and under such auspices the Turks commenced the war."

ALB, or ALBE, in the Romish church, a vestment of white linen hanging down to the feet, and answering to the surplice of the English clergy. In the ancient church, it was usual, with those newly baptized, to wear an alb, or white vestment; and hence the Sunday after Easter was called *dominica in albis*, on account of the albs worn by those baptized on easter-day.

ALB is also a name of a Turkish coin, otherwise called *asper*. See ASPER.

ALBA (anc. geog.), a town of the Marsi in Italy, situated on the north-side of the Lacus Fucinus, still retaining in its name. It stands upon an eminence, and is noted in Roman history for being the state prison where captive princes were shut up, after being barbarously dragged through the streets of Rome at the chariot wheels of a triumphant consul. Perses king of Macedon terminated his wretched career in this confinement, with his son, the last hope of an illustrious line of kings. Syphax the Numidian, and Bituinus king of the Averni, were also condemned to this gaol by the particular clemency of the senate, which sometimes indulged its savage disposition by putting its captives to death.

Alba being situated in the centre of Italy, amidst difficult mountainous passes, and far from all means of escape, was esteemed a most proper place for the purpose of guarding prisoners of importance. Artificial strength was added to its natural security by fortifications, which remain to this day in a state that proves their ancient solidity. For the entertainment of the garrison, which was required in a place of such consequence, an amphitheatre was erected, of which the ruins are still visible, as well as the foundations of a temple, and other buildings of Roman times.

Lucius Vitellius, brother to the emperor of that name, had a villa near this place, famous for the variety and excellence of its fruit-trees, which he had brought from Syria. His gardens were the nurseries where several of the most delicious stone-fruits, that are now so common in Europe, were first cultivated and multiplied.

It

It muſt have been neceſſary at Alba to ſhelter trees tranſplanted from Aſia, and to treat them with great tenderneſs and care, in order to rear them to perfection: for the climate of this high region is extremely rigorous in winter; the cold ſeaſon laſts long, and is accompanied with violent ſtorms of wind and falls of ſnow. The lake has been often frozen entirely over.

Alba Firma, or *Album*, in old cuſtoms, denoted rent paid in ſilver, and not in corn, which was called *black-mail.*

Alba Terra, one of the numerous names for the philoſopher's ſtone.

Alba Regalis. See Stull Weissenburgh.

Alba Helviorum, or *Albauguſta*, (anc. geog.), afterwards called *Vivarium*, now *Viviers*, in the ſouth-eaſt of Languedoc, on the Rhone. In the lower age the inhabitants were called *Albenſes*, and their city *Civitas Albenſium*, in the Notitia Galliæ. E. Long. 4. 45. Lat. 44. 50.

Alba Julia (anc. geog.) now *Weiſſenburg*, a town of Tranſylvania, on the river Mariſius, or Meriſch, to the weſt of Hermanſtat, ſuppoſed to be called *Alba Julia*, after Julia Domna the mother of Caracalla. There are, however, ſeveral inſcriptions found at or near Weiſſenburg, which bear Col. Apul. that is *Colonia Apulenſis*, without the leaſt mention of *Alba Julia*, though inſcribed after Caracalla's time. Add, that Ulpian, reciting the colonies of Dacia, calls this colony *Apulenſis*, and neither *Alba* nor *Julia*. Whence there is a ſuſpicion, that *Alba Julia* is a corruption of *Apulum*. It was alſo called *Apulum Auguſtum*. E. Long. 25. 0. Lat. 46. 46.

Alba Longa (anc. geog.), a colony from Lavinium, in Latium, eſtabliſhed by Aſcanius the ſon of Æneas, at the foot of the Mons Albanus: called *Alba*, from a white ſow found by Æneas, which farrowed 30 white pigs on that ſpot; which circumſtance was interpreted to portend the building of a city there in 30 years after (Propertius). The epithet *Longa* was added on account of its length. It was the royal reſidence till the building of Rome, as was foretold by Anchiſes (Virgil); was deſtroyed by Tullius Hoſtilius, all but the fane or temple; and the inhabitants were tranſplanted to Rome (Strabo).

Alba Pompeia (anc. geog.), on the river Ceba, now *Ceva*, in Liguria, the birth-place of the emperor Pertinax; a colony either eſtabliſhed at firſt by Pompey, or re-eſtabliſhed by him after having been before ſettled by Scipio. The inhabitants were called *Alpenſes Pompeiani*. At this day the town is ſimply called *Alba*, without any epithet.

ALBAHURIM, *figura ſexdecim laterum*, a figure of great importance according to aſtrological phyſicians, who build their prognoſtics on it.

ALBAN (St) is ſaid to have been the firſt perſon who ſuffered martyrdom for Chriſtianity in Britain; he is therefore uſually ſtyled the protomartyr of that iſland. He was born at Verulam, and flouriſhed towards the end of the third century. In his youth he took a journey to Rome, in company with Amphibalus a monk of Caerleon, and ſerved ſeven years as a ſoldier under the emperor Diocleſian. At his return home, he ſettled in Verulam; and, through the example and inſtructions of Amphibalus, renounced the errors of paganiſm, in which he had been educated, and became convert to the Chriſtian religion. It is generally agreed, that Alban ſuffered martyrdom during the great perſecution under the reign of Diocleſian; but authors differ as to the year when it happened: Bede and others fix it in 286; ſome refer it to the year 296; but Uſſerius reckons it amongſt the events of 303. The ſtory and circumſtances relating to his martyrdom, according to Bede, are as follows. Being yet a pagan (or at leaſt it not being known that he was a Chriſtian), he entertained Amphibalus in his houſe. The Roman governor being informed thereof, ſent a party of ſoldiers to apprehend Amphibalus; but Alban, putting on the habit of his gueſt, preſented himſelf in his ſtead, and was carried before that magiſtrate. The governor having aſked him of what family he was? Alban replied, "To what purpoſe do you inquire of my family; if you would know my religion, I am a Chriſtian." Then being aſked his name, he anſwered, "My name is Alban; and I worſhip the only true and living God, who created all things." The magiſtrate replied, "If you would enjoy the happineſs of eternal life, delay not to ſacrifice to the great gods." Alban anſwered, "the ſacrifices you offer are made to devils; neither can they help the needy, or grant the petitions of their votaries. His behaviour ſo enraged the governor, that he ordered him immediately to be beheaded. In his way to execution, he was ſtopped by a river, over which was a bridge ſo thronged with ſpectators that it was impoſſible to croſs it; the ſaint, as we are told, lifted up his eyes to heaven, and the ſtream was miraculouſly divided, and afforded a paſſage for himſelf and a thouſand more perſons. Bede does not indeed give us the name of this river; but, notwithſtanding this omiſſion, the miracle, we ſuppoſe, will not be the leſs believed. This wonderful event converted the executioner upon the ſpot, who threw away his drawn ſword, and, falling at St Alban's feet, deſired he might have the honour to die with him. This ſudden converſion of the headſman occaſioning a delay in the execution till another perſon could be got to perform the office, St Alban walked up to a neighbouring hill, where he prayed for water to quench his thirſt, and a fountain of water ſprung up under his feet: here he was beheaded, on the 23d of June. The executioner is ſaid to have been a ſignal example of divine vengeance; for as ſoon as he gave the fatal ſtroke, his eyes dropt out of his head. We may ſee the opinion of Mr Milton in regard to this narrative, in his Hiſtory of England. His words are theſe, ſpeaking of St Alban, "The ſtory of whoſe martyrdom, ſoiled and worſe martyred with the fabling zeal of ſome idle fancies, more fond of miracles than apprehenſive of the truth, deſerves no longer digreſſion." Between 4 or 500 years after St Alban's death, Offa, king of the Mercians, built a very large and ſtately monaſtery to his memory; and the town of St Albans in Hertfordſhire takes its name from that protomartyr.

ALBANA (anc. geog.), a ſea-port town of Albania, on the Caſpian ſea, between the rivers Caſius and Albanus; now called *Bachu* or *Bachy*, giving name to the Caſpian ſea, viz. *Mar de Bahu*. E. Long. 49. 0. Lat. 40. 0.

ALBANENSES, in church-hiſtory, the ſame with Albigenſes, according to ſome: according to others, different. Theſe, however, who are for diſtinguiſhing them.

them, attribute the same opinions to both; only making the Albanenses to have been prior in respect of time, as having been found towards the close of the eighth century; whereas the Albigenses appeared not till the twelfth. See ALBIGENSES.

ALBANI, in Roman antiquity, a college of the *salii*, or priests of Mars; so called from mount Albanus, the place of their residence. See SALII.

ALBANI (Francis), a celebrated painter, born in Bologna, March 17, 1578. His father was a silk merchant, and intended to bring up his son to that business; but Albani having a strong inclination to painting, when his father died, devoted himself entirely to that art, though then but twelve years of age. He first studied under Denys Calvert; Guido Rheni being at the same time under this master, with whom Albani contracted a very great friendship. Calvert drew but one profile for Albani, and afterwards left him entirely to the care of Guido; under whom he made great improvement, his fellow-disciple instructing him with the utmost humanity and good humour. He followed Guido to the school of the Caraches: but a little after their friendship for each other began to cool; which was owing perhaps to the pride of Albani, who could not bear to see Guido surpass him, or to the jealousy of Guido at finding Albani make so swift a progress. They certainly endeavoured to eclipse one another; for when Guido had set up a beautiful altar-piece; Albani would oppose to it some fine picture of his: thus did they behave for some time, and yet spake of each other with the highest esteem. Albani, after having greatly improved himself under the Caraches, went to Rome, where he continued many years, and married in that city; but his wife dying in childbed, at the earnest request of his relations he returned to Bologna, where he entered again into the state of matrimony. His second wife (Doralice) was well descended, but had very little fortune; which he perfectly disregarded, so strongly was he captivated with her beauty and good sense. Albani, besides the satisfaction of possessing an accomplished wife, reaped likewise the advantage of having a most beautiful model; so that he had now no occasion to make use of any other woman to paint a Venus, the Graces, Nymphs, and other deities, whom he took a particular delight in representing. His wife answered this purpose admirably well; for besides her bloom of youth, and the beauty of her person, he discovered in her so much modesty, so many graces and perfections, so well adapted to painting, that it was impossible for him to meet with a more finished woman. She afterwards brought him several boys, all extremely beautiful and finely proportioned; so that she and her children were the originals of his most agreeable and graceful compositions. Doralice was so conformable to his intentions, that she took a pleasure in setting the children in different attitudes, holding them naked, and sometimes suspended by strings, when Albani would draw them in a thousand different ways. It was from them, too, that the famous sculptors Flamand and Argaldi modelled their little Cupids.

Albani was of a happy temper and disposition; his paintings, says Malvasia, breathing nothing but content and joy. Happy in a force of mind that conquered every uneasiness, his poetical pencil carried him through the most agreeable gardens to Paphos and Citheria: those delightful scenes brought him over the lofty Parnassus to the delicious abodes of Apollo and the Muses; whence what Du Fresnoy says of the famous Giulio Romano may be justly applied to Albani:

Taught from a child in the bright Muses' grots,
He open'd all the treasures of Parnassus,
And in the lovely poetry of painting
The myst'ries of Apollo has reveal'd.

He died the 4th of October 1660, to the great grief of all his friends and the whole city of Bologna. Malvasia has preserved some verses of Francisco de Lemene, intended for his monument; the sense whereof is, "That the mortal remains of the illustrious Albani, he who gave life to shade, lie interred in this tomb: the earth never produced so wonderful an artist, or a hand equal to his immortal one; which gave colours to the soul, and a soul to colours. Prometheus animated clay, and gave life by means of the sun; but Albani animated merely by the assistance of shade." He was very famous in his lifetime, and had been visited by the greatest painters. Several princes honoured him with letters; and amongst the rest King Charles I. who invited him to England by a letter signed with his own hand.

ALBANIA, a province of Turkey in Europe, on the Gulph of Venice, bounded by Livadia on the south, by Thessaly and Macedonia on the east, and on the north by Bosnia and Dalmatia. The people are strong, large, courageous, and good horsemen; but are said to be of a thievish disposition: the grand seignior procures excellent soldiers from hence, particularly cavalry, known by the name of *Arnauts*. There are several large towns in this province; and the inhabitants are almost all Christians of the Greek church, and descended from the ancient Scythians. Formerly it was part of the kingdom of Macedonia. Their chief manufacture is carpets. The principal places are Durazzo, Velona, Antivari, Scutari, Croya, Alesso, Dibra, Dolcigno, and Albanapoli. Long. from 28° to 31° E. Lat. from 39° to 43° N.

ALBANIA, a country of Asia, bounded on the west by Iberia; on the east by the Caspian sea; on the north by mount Caucusus; on the south by Armenia, and the river Cyrus, now Kur; which, springing from the Moschian mountains that separate Colchis from Armenia, and watering the country of Mokan, receives the Aragus and Araxes, and falls into the Caspian sea within a small distance from the southern borders of this country.—The whole country formerly called *Albania*, now goes under the names of *Shirwan* and *East-Georgia*, and is extremely fruitful and pleasant. The ancient historians take notice of the Albanian men being tall, strong-bodied, and, generally speaking, of a very graceful appearance; far excelling all other nations in comeliness as well as stature. Modern travellers take no notice of the appearance of the men; but extol the beauty of the women, which seems to be unnoticed by the ancients. The Albanians were anciently an independent and pretty powerful people; but we find no mention made of their kings till the reign of Alexander the Great, to whom the king of Albania is said to have presented a dog of an extraordinary fierceness and size.—It does not appear that the Alba-

 nians

nians were ever conquered by the Romans, even when their power was at its greatest height; though, when they ventured to engage in war with that powerful empire, they were always defeated, as might naturally be expected.

ALBANO, a town of Italy, on a lake of the same name, in the Campagnio of Rome. It was called by the ancients *Albanum Pompeii*, and built out of the ruins of the ancient Alba Longa, which was destroyed by Tullus Hostilius. It stands within twelve miles south-east of Rome, and for the pleasantness of its situation is the summer retirement of a great many Roman princes. It is likewise the see of a bishop, who is one of the six senior cardinals. The town is famous for its excellent wine, and the ruins of a mausoleum, which, according to the tradition of the inhabitants, was made for Ascanius. The prospect from the garden of the Capuchins is extremely pleasant, taking in the Campania of Rome, and terminating in a full view of the Tuscan sea. Close by the town lies the Alban lake, of an oval figure, and about seven miles in circumference, which, by reason of the high mountains round it, looks like the area of a great amphitheatre. It abounds with excellent fish, and over against the hermitage it is said to be unfathomable. The mountain of Albano is called *Monte Cavo*, on the top of which was a celebrated temple dedicated to Jupiter and Juno. Near the Capuchins there is another convent of Franciscans; and not far from thence the palace of Cardinal Barberini, remarkable for very pleasant gardens, with the ruins of ancient baths, and several old fragments of Mosaic work. E. Long. 13. 10. N. Lat. 41. 43.

There is likewise another town of the same name in the Basilicate of the kingdom of Naples, remarkable for the fertility of the surrounding territory, and for the nobility of the inhabitants.

ALBANS (St.), a market town of Hertfordshire, is a very great thoroughfare, accommodated with good inns, on the north-west road from London, at the distance of 21 miles. This town sends two members to parliament, gives the title of *duke* to the noble family of Beauclerc, and has one of the best markets for wheat in England. St Albans is seated near the ruins of an ancient Roman city, by Tacitus called *Verolam*; and by the Saxons *Watlingcester*, because it is seated on the road called *Watlingstreet*. Nothing now remains of Verolam but the ruins of old walls; in the fields adjacent to which they continue to find Roman coins, as they formerly found tessellated pavements. In memory of St Alban, Offa, king of the Mercians. *anno* 795, erected an abbey, calling it *St Albans*; and near it the town of the same name was afterwards built. The church of the abbey is remaining to this day: time and the weather have made it look like stone on the out side; but if you break a bit off, the redness of the brick immediately appears. When the monasteries were dissolved, the townsmen paid L.400 to prevent its being levelled with the ground, and have since converted it into a parish church, which, for its largeness, beauty, and antiquity, claims a particular regard. It had a very noble font of solid brass, in which the children of the kings of Scotland were used to be baptized; and was brought from Edinburgh, by sir Philip Lea, when that city was in flames; but in the times of the late civil wars, it was taken away. Not many years since, a tomb was discovered in this church, said to be that of Humphrey Duke of Gloucester: when the leaden coffin was opened, the body was pretty entire, being preserved in a sort of pickle. There was a stately cross in the middle of the town, as there were in many other places where queen Eleanor's body rested when it was brought out of the north for interment at Westminster; but it has been demolished, as some say, by the inhabitants. The market-days are Wednesdays and Saturdays. W. L. 0. 12. N. L. 51. 44.

ALBANUS MONS (anc. geog.), now called *Mont Albano*, 16 miles from Rome, near where Alba Longa stood.

ALBANUS MONS (anc. geog.), to the north of Istria, called *Albius* by Strabo; the extremity of the Alps, which, together with the mountains to the east, joining it, called *Montes Bebii*, separates the farther Liburnia and Dalmatia from Pannonia.

ALBANY, a city of North America, in the state of New-York, situated upon the west side of Hudson's river, 160 miles north of the city of New-York. It contains about 4000 inhabitants, collected from almost all parts of the northern world. The houses are built in the old Dutch Gothic stile, with the gable end to the street, and are seldom more than one story and an half high; they are by no means elegant, but are kept very clean. Albany, from its being seated on a fine river, at the head of sloop navigation, surrounded with a rich and extensive back country, and the store-house of the trade to and from Canada, is in a flourishing condition. It has of late, however, had a formidable rival in the new city of Hudson. W. Long. 44. 29. N. Lat. 42. 36.

ALBARAZIN, a strong town, and one of the most ancient of the kingdom of Arragon in Spain. It is seated upon an eminence, near the river Guadalquivir, a little below its source, and on the frontiers of Valencia and New Castile. It is the seat of a bishop; and produces the best wool in all Arragon. It is about 100 miles east of Madrid. E. Long. 2. 10. N. Lat. 40. 32.

ALBARII, in antiquity, properly denoted those who gave the whitening to earthen vessels, &c. In which sense they stood contradistinguished from *Dealbatores*, who whitened walls.

ALBARIUM OPUS, in the ancient building, the incrustation or covering of the roofs of houses with white plaster, made of mere lime. This is otherwise called *opus album*. It differs from *Tectorium*, which is a common name given to all roofing or ceiling, including even that formed of lime and sand, or lime and marble; whereas *Albarium* was restrained to that made of lime alone.

ALBATROSS, in ornithology, a species of the diomedea. See DIOMEDEA.

ALBAZIN, a town of Greater Tartary, with a strong castle. It is situated upon the river Amur, or Yamour, and belongs to the Muscovites. E. Long. 103. 30. N. Lat. 54. 0.

ALBE, a small piece of money, current in Germany, worth only a French sol and seven deniers.

ALBEMARLE, or AUMARLE, a town of France, in Upper Normandy, and in the territory of Caux, from whence the noble family of Keppel takes the title of *Earl*. The serges of this town are in high esteem.

It is seated on the declivity of a hill, on the confines of Picardy, 35 miles N. E. of Rouen, and 70 N. W. of Paris. E. Long. 2. 21. N. Lat. 49. 50.

Albemarle, the most northern part of the state of North Carolina.

ALBENGUA, a town of Italy, in the territory of Genoa. It is the see of a bishop; and is a very ancient handsome town, but not well peopled on account of the insalubrity of the air. However, it is seated in a very beautiful plain, which is well cultivated; and the outside of the town is surrounded with olive-trees. It is a sea-port, about 38 miles S. W. of Genoa. E. Long. 8. 13. N. Lat. 44. 4.

ALBERNUO, a kind of camblet brought from the Levant by the way of Marseilles.

ALBERONI (Julius) the son of a poor gardener in the suburbs of Placentia, born in 1664; who, by his great abilities and good fortune, rose from this low original, to the employment of first minister of state at the court of Spain, and to the dignity of cardinal. He roused that kingdom out of the lethargy it had sunk into for a century past; awakened the attention, and raised the astonishment, of all Europe, by his projects; one of which was to set the Pretender on the throne of Great Britain. He was at length deprived of his employment, and banished to Rome. He died in 1752, at the great age of 89. His *Testament Politique*, collected from his memoirs and letters, was published at Lausanne in 1753.

ALBERT, Margrave of Brandenburg, and the last grand master of the Teutonic Order, laid aside the habit of his order, embraced Lutheranism, and concluded a peace at Cracow in 1525, by which he was acknowledged Duke of the east part of Prussia (formerly called for that reason *Ducal Prussia*), but to be held as a fief of Poland, and to descend to his male heirs. See Prussia.

ALBERTI (Leone Battista), was descended from a noble family in Florence; and was perfectly acquainted with painting, sculpture, and architecture. He wrote of all three in Latin; but his studies did not permit him to leave any thing considerable behind him in painting. He was employed by pope Nicholas V. in his buildings, which he executed in a beautiful manner; and his work on architecture, which consists of ten books, is greatly esteemed. He also wrote some treatises of morality, and a piece on arithmetic. He died in 1485.

ALBERTISTS, a sect of scholastics, so named from their leader Albertus Magnus.

ALBERTUS (Magnus), a Dominican friar, and afterwards bishop of Ratisbon, was one of the most learned men and most famous doctors of the 13th century. He is said to have acted as a man-midwife; and some have been highly offended that one of his profession should follow such an employment. A book intitled *De Natura Rerum*, of which he was reputed the author, gave rise to this report. In this treatise there are several instructions for midwives, and so much skill shown in their art, that one would think the author could not have arrived at it without having himself practised: but the advocates for Albert say he was not the writer thereof, nor of that other piece *De Secretis Mulierum*; in which there are many phrases and expressions unavoidable on such a subject, which gave great offence, and raised a clamour against the supposed author. It must be acknowledged, however, that there are, in his Comment upon the Master of Sentences, some questions concerning the practice of conjugal duty, in which he has used some words rather too gross for chaste and delicate ears: but they allege what he himself used to say in his own vindication, that he came to the knowledge of so many monstrous things at confession, that it was impossible to avoid touching upon such questions. Albert was certainly a man of a most curious and inquisitive turn of mind, which gave rise to other accusations brought against him. They say, that he laboured to find out the philosopher's stone, that he was a magician; and that he made a machine in the shape of a man, which was an oracle to him, and explained all the difficulties he proposed. He had great knowledge in the mathematics, and by his skill in that science might probably have formed a head with springs capable of articulating sounds; like to the machines of Boetius, of which Cassiodorus has said, "Metals lowe; the birds of Diomedes trumpet in brass; the brazen serpent hisses; counterfeited swallows chatter, and such as have no proper note, from brass send forth harmonious music." John Matthæus de Luna, in his treatise *De Rerum Inventoribus*, has attributed the invention of fire-arms to Albert; but in this he is confuted by Naude, in his *Apologie des Grands Hommes*. We are told, that Albert was naturally very dull, and so incapable of instruction as to be upon the point of quitting the cloister, from despair of learning what his habit required: but that the Holy Virgin appeared to him, and asked him in which he chose to excel, philosophy or divinity? that having chosen the former, she assured him he would become incomparable therein; but that, as a punishment for not preferring divinity, he should sink, before he died, into his former stupidity. It is added, that after this apparition he had an infinite deal of wit; and that he advanced in all the sciences with so quick a progress, as utterly astonished his masters: but that three years before his death, he stopped short when reading a divinity-lecture at Cologn; and having in vain endeavoured to recal his ideas, he found that the Virgin's prediction was accomplished. "It would be very unnecessary (says Bayle, after relating these particulars) to observe that they are fables. Those who would believe me need not be told this, since they would judge in the same manner of their own accord; and as for such as think otherwise, they would not alter their opinion by reading here, that I am of a different way of thinking." Albert died at Cologn, November 15, 1280. His works were printed at Lyons, in 1651, in 21 volumes in folio.

ALBERTUS, a gold coin, worth about 14 French livres: it was coined during the administration of Albertus archduke of Austria.

ALBESIA, in antiquity, a kind of shields otherwise called *Decumana*. See Decumana.

ALBI, a city of France, the capital of the Albigeois, in Languedoc, and the see of an archbishop. The cathedral is dedicated to St. Cecilia, and has one of the finest choirs in the kingdom. Here is a very valuable silver shrine, of exquisite workmanship, of the Mosaic kind: it contains the reliques of St Clair, the first bishop of this city. The chapel of this pretended saint

saint is magnificent, and adorned with paintings. The Lice is a fine large walk without the city: what distinguishes this from all others, is a terras above a deep mall which serves instead of a fosse; it is bordered with two rows of very fine trees, which are kept in excellent order. There are four gates, through which you may view all the beauties of a delightful plain. At one end of this is the convent of the Dominicans. The archbishop's palace is very beautiful. The river washes its walls, and serves both for an ornament and defence. This city it seated on the river Tarn, 35 miles north-by-west of Toulouse, and 250 south of Paris. E. Long. 0. 52. N. Lat. 43. 56.

The Albigeois is a small territory about 27 miles in length, and 20 in breadth, abounding in corn, woad, grapes, saffron, plums, and sheep: and the inhabitants drive a great trade in dried prunes, grapes, a coarse sort of cloth, and wines of Gaillac. These wines are the only sort hereabouts that are fit for exportation: they are carried down to Bourdeaux, and generally sold to the British. They have likewise several coal-mines.

ALBIGENSES, in church-history, a sect or party of reformers, about Toulouse and the Albigeois in Languedoc, who sprung up in the 12th century, and distinguished themselves by their opposition to the discipline and ceremonies of the Romish church.

This sect had their name, it is supposed, either by reason there were great numbers of them in the diocese of Albi, or because they were condemned by a council held in that city. In effect, it does not appear that they were known by this name before the holding of that council. The *Albigenses* were also called *Albiani*, *Albigesei*, *Albii*, and *Albanenses*, though some distinguish these last from them. Other names given to them are, *Henricians*, *Abelardists*, *Bulgarians*, &c. some on account of the qualities they assumed; others on that of the country from whence it is pretended they were derived; and others on account of persons of note who adopted their cause, as Peter de Brius, Arnold de Bresse, Abelard, Henry, &c. Berengarius, if not Wickliff himself, is by some ranked in the number. The *Albigenses*, are frequently confounded with the *Waldenses*; from whom, however, they differ in many respects, both as being prior to them in point of time, as having their origin in a different country, and as being charged with divers heresies, particularly Manicheism, from which the *Waldenses* are exempt. But several Protestant writers have vindicated them from that imputation. Dr Allix shows, that a great number of *Manichees* did spread over the western countries from Bulgaria; and settled in Italy, Languedoc, and other places, where there were also *Albigenses*; by which means, being both under the imputation of *heresy*, they came, either by ignorance or malice, to be confounded, and called by the same common name, though in reality entirely different.

Other errors imputed to them by their opponents, the monks of those days, were, That they admitted two Christs; one evil, who appeared on earth; the other good, who has not yet appeared: That they denied the resurrection of the body; and maintained human souls to be dæmons imprisoned in their bodies, by way of punishment for their sins: That they condemned all the sacraments of the church; rejected baptism as useless; held the eucharist in abhorrence; excluded the use of confessions and penance; maintained marriage unlawful; laughed at purgatory, prayers for the dead, images, crucifixes, &c.—There were likewise said to be two classes of them; the Perfect, and the Believers. The perfect boasted of their living in continence, of eating neither flesh, eggs, nor cheese. The believers lived like other men, and were even loose in their morals; but they were persuaded they should be saved by the faith of the perfect, and that none were damned who received imposition of hands from them. But from these charges also they are generally acquitted by Protestants; who consider them as the pious inventions of the Romish church, whose members deem it meritorious by any means to blacken heretics.

However this be, the Albigenses grew so formidable, that the Catholics agreed upon a holy league or croisade against them. They were at first supported by Raimond, count of Toulouse. Pope Innocent III. desirous to put a stop to their progress, sent a legate into their country; which failing, he stirred up Philip Augustus, king of France, and the other princes and great men of the kingdom, to make war upon them. Upon this the count of Toulouse, who had sided with them, made his submission to the pope, and went over to the Catholics: but soon after, finding himself plundered by the croisaders, he declared war against them, and was joined by the king of Arragon. His army was defeated at the siege of Muret, where he himself was killed, and the defeat followed by the surrender of the city of Toulouse, and the conquest of the greatest part of Languedoc and Provence. His son Raimond succeeded him; who agreed with the king and the pope to set up the inquisition in his estates, and to extirpate the Albigenses. In an assembly held at Milan, the archbishop of Toulouse drew up articles; agreeable to which the court made a most ample declaration against them, which he published at Toulouse in 1253. From this time the Albigenses dwindled by little and little, till the times of the reformation: when such of them as were left fell in with the Vaudois, and became conformable to the doctrine of Zuinglius and the disciples of Geneva.

ALBIGENSES is also a name sometimes given to the followers of Peter Vaud, or Waldo; and hence synonymous with what we more properly call *Waldenses*, or Poor Men of Lyons. In this sense the word is applied by Camerarius, Thuanus, and several other writers. The reason seems to be, that the two parties agreed in their opposition to the papal innovations and incroachments, though in divers other respects said to be different enough. The bishop of Meaux labours hard to support a distinction between the two sects, alleging that the *Albigenses* were heretics and Manichees; whereas the *Waldenses* were only schismatics, not heretics; being sound as to articles of faith, and only separating from the church of Rome on account of forms and discipline. Dr Allix endeavours to set aside the distinction; and shows, that both of them hold the same opinions, and were equally condemned and held for heretics: and this not for points of faith, but for declaiming against the papal tyranny and idolatry, and holding the pope to be the Antichrist; which last, according to M. de Meaux, constitutes nothing less than

 Manicheism.

Manicheism. In this sense the Lollards and Wickliffites in England were not only Albigenses but Manichees.

ALBINTEMELIUM, Albintimilium, (Tacitus;) or at full length, Albium Intemelium, (Pliny, Strabo); now *Vintimiglia*, situated in the southwest of the territory of Genoa, near the borders of the county of Nice, with a port on the Mediterranean, at the mouth of the rivulet Rotta, almost about half-way between Monaco and S. Remo. E. Long. 7. 40. Lat. 43. 17.

ALBIOECE, or Alebece, (Pliny, Strabo); otherwise called *Reii Apollinares*, from their superstitious worship of Apollo; also *Civitas Reiensium*; now *Riez*, in Provence, about 18 leagues to the north-east of Toulon, on the north side of the rivulet Verdon; was originally a Roman colony, (Inscription). It is sometimes written *Regium*. The people were called *Albici*, (Cæsar.) E. Long. 1. 0. Lat. 43. 20.

ALBINI, in antiquity, the workmen employed in what was called *Opus Albarium*. They make a different profession from the *dealbatores* or *whiteners*.

ALBINOS, the name by which the Portuguese call the white Moors, who are looked upon by the negroes as monsters. They at a distance might be taken for Europeans; but, when you come near them, their white colour appears like that of persons affected with a leprosy.

In Saussure's *Voyages dans les Alpes*, is the following account of two boys, at Chamouni, who have been called *Albinos*. "The elder, who was at the end of the year 1785 about twenty, or one-and-twenty years of age, had a dull look, with lips somewhat thick, but nothing else in his features to distinguish him from other people. The other, who is two years younger, is rather a more agreeable figure: he is gay and sprightly, and seems not to want wit. But their eyes are not blue; the iris is of a very distinct rose-colour: the pupil too, when viewed in the light, seems decidedly red; which seems to demonstrate, that the interior membranes are deprived of the uvea, and of that black mucous matter that should line them. Their hair, their eye-brows, and eye-lashes, the down upon their skin, were all, in their infancy, of the most perfect milk-white colour, and very fine; but their hair is now of a reddish cast, and has grown pretty strong. Their sight too is somewhat strengthened; though they exaggerate to strangers their aversion for the light, and half-shut the eye-lids, to give themselves a more extraordinary appearance. But those who, like me, have seen them in their infancy, before they were tutored to this deceit, and when too few people came to Chamouni to make this affectation profitable to them, can attest that then they were not very much offended with the light of day. At that time, they were so little desirous of exciting the curiosity of strangers, that they hid themselves to avoid such; and it was necessary to do a sort of violence to them before they could be prevailed on to allow themselves to be inspected. It is also well known at Chamouni, that when they were of a proper age they were unable to tend the cattle like the other children at the same age; and that one of their uncles maintained them out of charity, at the time of life when others were capable of gaining a subsistence by their labour.

"I am therefore of opinion, that we may consider these two lads as true albinos: for if they have not the thick lips and flat noses of the white negroes, it is because they are albinos of Europe, not of Africa. This infirmity affects the eyes, the complexion, and the colour of the hair; it even diminishes the strength, but does not alter the conformation of the features. Besides, there are certainly in this malady various degrees: some may have less strength, and be less able to endure the light: but these circumstances in those of Chamouni are marked with characters sufficiently strong to intitle them to the unhappy advantage of being classed with that variety of the human species denominated albinos.

"When nature presents the same appearance often, and with circumstances varied, we may at last discover some general law, or some relation which that appearance has with known causes: but when a fact is so singular and so rare, as that of those albinos, it gives but little scope to conjectures; and it is very difficult to verify those by which we attempt to explain it.

"I at first imagined that this disease might be referred to a particular sort of organic debility; that a relaxation of the lymphatic vessels within the eye might suffer the globules of the blood to enter too abundantly into the iris, the uvea, and even into the retina which might occasion the redness of the iris and of the pupil. The same debility seemed also to account for the intolerance of the light, and for the whiteness of the hair.

"But a learned physiologist, M. Blumenbach, professor in the university at Gottingen, who has made many profound observations on the organs of sight, and has considered with great attention the albinos of Chamouni, attributes their infirmity to a different cause.

"The study of comparative anatomy has furnished him with frequent opportunities of observing this phenomenon; he has found it in brutes, in white dogs, and in owls; he says, it is generally to be seen in the warmest blooded animals; but that he has never met with it in those with cold blood.

"From his observations, he is of opinion, that the redness of the iris, and of the other internal parts of the eye, as well as the extreme sensibility that accompanies this redness, is owing to the total privation of that brown or blackish mucus, that, about the fifth week after conception, covers all the interior parts of the eye in its sound state. He observes, that Simon Pontius, in his treatise *de Coloribus Oculorum*, long ago remarked, that in blue eyes the interior membranes were less abundantly provided with this black mucus, and were therefore more sensible to the action of light. This sensibility of blue eyes agrees very well, says M. Blumenbach, with northern people, during their long twilight; while, on the contrary, the deep black in the eyes of negroes enables them to support the splendor of the sun's beam in the torrid zone.

"As to the connection between this red colour of the eyes and whiteness of the skin and hair, the same learned physiologist says, that it is owing to a similarity of structure, *consensus ex similitudine fabricæ*. He asserts, that this black mucus is formed only in the delicate cellular substance, which has numerous blood-vessels contiguous to it, but contains no fat; like the inside of the eye, the skin of negroes, the spotted palate of several domestic animals, &c. And, lastly, he says, Albinos.

says, that the colour of the hair generally corresponds with that of the iris. *Gazette litt. de Cotingue*, Oct. 1784.

"At the very time that L. Blumenbach was reading this memoir to the Royal Society of Gottingen, M. Buzzi, surgeon to the hospital at Milan, an eleve of the celebrated anatomist *Moscati*, published, in the *Opuscoli Scelti de Milan*, 1784, tom. vii. p. 11 a very interesting memoir, in which he demonstrates by dissection what Blumenbach had only supposed.

"A peasant of About 30 years of age died at the hospital of Milan of a pulmonary disorder. His body being exposed to view, was exceedingly remarkable by the uncommon whiteness of the skin, of the hair, of the beard, and of all the other covered parts of the body. M. Buzzi, who had long desired an oportunity of dissecting, such a subject, immediately seized upon this. He found the iris of the eyes perfectly white, and the pupil of a rose-colour. The eyes were dissected with the greatest possible care, and were found entirely destitute of that black membrane which anatomists call the *uvea*; it was not to be seen either behind the iris, or under the reetina: within the eye there was only found the choroid coat extremely thin and tinged, of a pale red colour, by vessels filled with discoloured blood. What was more extraordinary, the skin, when detach ed from different parts of the body, seemed also entirely divested of the *rete mucosum* maceration did not discover the least vestige of this, nor even in the wrinkles of the abdomen, where it is most abundant and most visible.

"M. Buzzi likewise accounts for the whiteness of the skin and of the hair, from the absence of the *rete mucosum*, which, according to him, gives the colour to the cuticle, and to the hairs that are scattered over it. Among other proofs of this opinion, he alleges a well-known fact, that if the skin of the blackest horse be accidently destroyed in any part of the body, the hairs that afterwards grow on that part are always white, because the *rete mucosum* which tinges those hairs is never regenerated with the skin.

"The proximate cause of the whiteness of albinos, and the colour of their eyes, seems therefore pretty evidently to depend on the absence of the *rete mucosum*: But what is the remote cause?

"In the first place, it seems probable that men affected with this infirmity form no distinct species, for they are produced from parents that have dark skins and black eyes. What is it then that destroys the *rete mucosum* in such persons? M. Buzzi relates a singular fact, which seems to throw some light on this subject.

"A woman of Milan, named Calcagni, had seven sons. The two eldest had brown hair, and black eyes; the three next had white skins, white hair, and red eyes; the two last resembled the two eldest. It was said that this woman, during the three pregnancies that produced the albinos, had a continual and immoderate appetite for milk, which she took in great quantities: but that when she was with-child of the other four children, she had no such desire. It is not however ascertained, that this preternatural appitite was not itself the effect of a certain heat, or internal disease, which destroyed the *rete mucosum* in the children before they were born.

"The albinos of Chamouni are also the offspring of parents with dark skins and black eyes. They have three sisters by the same father and mother, who are also brunettes. One of them that I saw had the eyes of a dark brown, and the hair almost black. They are said, however, to be all afflicted with a weakness of sight. When the lads are married, it will be curious to observe how the eyes of their children will be formed. The experiment would be particularly decisive if they were married to women like themselves. B this faulty conformation seems to be more rare among women than among men; for the four of Milan, the two of Chamouni, the one described by Maupertuis, the one by Helvetius, and almost all the instances of these singular productions, have been of our sex. It is known, however, that there are races of men and women affected with this disease, and that these races perpetuate themselves, in Guinea, in Java, at Panama, &c.

"Upon the whole, this degeneration does not seem to be owing to the air of the mountains; for though I have traversed the greatest part of the Alps, and the other mountains in Europe, these are the only individuals of the kind that ever I met with."

Albinovanus, Albinus.

ALBINOVANUS, a Latin poet, whom Ovid surnamed the *Divine*. There is now nothing of his extant, except an Elegy on Drusus, and another on the Death of Mecænas.

ALBINUS (Bernhard Siegfred), a celebrated physician and anatomist, was born, of an illustrious family, at Francfort on the Oder in 1697. His father was then professor of the practice of medicine in the university of Francfort; but in the year 1702 he repaired to Leyden, being nominated professor of anatomy and surgery in that university. Here his son had an opportunity of studying under the most eminent masters in Europe, who, from the singular abilities which he then displayed, had no difficulty in prognosticating his future eminence. But while he was distinguished in every branch of literature, his attention was particularly turned to anatomy and surgery. His peculiar attachment to these branches of knowledge gained him the intimate friendship of Ruysch and Rau, who at that time flourished in Leyden; and the latter, so justly celebrated as a lithotomist, is said to have seldom performed a capital operation without inviting him to be present. Having finished his studies at Leyden, he went to Paris, where he attended the lectures of Du-Verney, Vaillant, and other celebrated professors. But he had scarce spent a year there, when he was invited by the curators of the university of Leyden, to be a lecturer in anatomy and surgery in that place. Though contrary to his own inclination, he complied with their request, and upon that occasion was created Dr of physic without any examination. Soon after, upon the death of his father, he was appointed to succeed him as professor of anatomy; and upon being admitted into that office on the 9th of November 1721, he delivered an oration, *De vera via ad fabricæ humani corporis cognitionem ducente*; which was heard with universal approbation. In the capacity of a professor, he not only bestowed the greatest attention upon the instruction of the youth entrusted to his care, but in the improvement of the medical-art. With this view, he published many important discoveries of his own; and by elegant editions, turned the attention of physicians to works of merit, which might otherwise have been neglected.

neglected. By these means his fame was soon extended over Europe; and the societies of London, Petersburgh, and Harlem, cheerfully received him as an associate. In 1745, he was appointed professor of the practice of medicine at Leyden, and was succeeded in the anatomical chair by his brother Frid. Bern. Albinus. He was twice rector of the university, and as often he refused that high honour when it was voluntarily offered him. At length, worn out by long service and intense study, he died on the 9th of September 1770, in the 74th year of his age.

ALBION, the ancient name of BRITAIN.

New ALBION, a name given by Sir Francis Drake to California.

ALBIREO, (in Astronomy) a star of the third or fourth magnitude, in the constellation CYGNUS.

ALBIS, (in anc. geog.) now the Elbe, which divided ancient Germany in the middle, and was the boundary of the ancient geography of Germany, so far as that country was known to the Romans: all beyond they owned to be uncertain, no Roman except Drusus and Tiberius having penetrated so far as the Elbe. In the year of the building of the city 744, or about six years before Christ, Domitius Ahenobarbus, crossing the river with a few, merited the ornaments of a triumph; so glorious was it reckoned at Rome to have attempted the passage. In the following age, however, the river that before occupied the middle of ancient Germany, became its boundary to the north, from the irruptions of the Sarmatæ, who possessed themselves of the Transalbin Germany. The Elbe rises in the borders of Silesia, out of the Risenberg, runs through Bohemia, Misnia, Upper Saxony, Anhalt, Magdeburg, Bandenburg, Danneberg, Lauenburg, Holstein, and after being swelled by many other rivers, and passing by Hamburg and Gluckstadt, falls into the German, or North sea, to both which places the river is navigable by large vessels.

ALBISOLA, a small town belonging to the republic of Genoa: here is a porcelain manufacture, and several country-houses of the Genoese nobility. It was bombarded in 1745 by the English. E. Long. 8. 20. N. Lat. 44. 15.

ALBOGALERUS, in Roman antiquity, a white cap worn by the *flamen dialis*, on the top of which was an ornament of olive branches.

ALBORAK, amongst the Mahometan writers, the beast on which Mahomet rode in his journeys to heaven. The Arab commentators give many fables concerning this extraordinary vehicle. It is represented as of an intermediate shape and size between an ass and a mule. A place, it seems, was secured for it in paradise at the intercession of Mahomet; which, however, was in some measure extorted from the prophet, by Alborak's refusing to let him mount him when the angel Gabriel was come to conduct him to heaven.

ALBORO, in zoology, a name by which the erythrinus, a small red fish, caught in the Mediterranean, is commonly known in the markets of Rome and Venice.

ALBOURG, a town of Denmark, in North Jutland, capital of the diocese of the same name, and a bishop's see. It has this name, which signifies *eel-town*, on account of the great number of eels taken here. It is seated on a canal, 10 miles from the sea, 30 north of Wiburgh, and 50 north of Arhuys. It has an exchange for merchants, and a safe and deep harbour. They have a considerable trade in herrings and corn; and a manufactory of guns, pistols, saddles, and gloves. E. Long. 29. 16. N. Lat. 56. 35.

ALBRICIUS, born at London, was a great philosopher, a learned and able physician, and well versed in all the branches of polite literature. He lived in the 11th century, and wrote several works in Latin, particularly, 1. Of the origin of the gods. 2. The virtues of the ancients. 3. The nature of poison, &c.

ALBUCA, BASTARD STAR-OF-BETHLEHEM: A genus of the monogynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 10th order, *Coronariæ*. The characters are: The *calyx* is wanting: The *corolla* consists of six oval oblong petals, which are persistent: The *stamina* consist of six three-sided filaments the length of the corolla: Of these, three are fertile, with versatile antheræ; three are barren, without antheræ: The *pistillum* has an oblong three-sided germen; the stylus is three-sided: The *pericarpium* is an oblong obtuse triangular capsule, having three cells and three valves. The *seeds* are numerous, flat, and incumbent. Of this genus Linnæus reckons only two.

Species. 1. The major, or star-flower, with spear-shaped leaves. This is a native of Canada, and some other parts of North America: the root is bulbous; from whence shoot up eight or ten long, narrow, spear-shaped leaves. In the centre of these arises a flower-stem, a foot or more in height, garnished with a loose spike of greenish yellow flowers. After the flowers are past, the germen swells to a three-cornered capsule, having three cells filled with with flat seeds. 2. The minor, or African star-flower, is a native of the Cape of Good Hope. This hath also a pretty large bulbous root, from which arise four or five narrow awl-shaped leaves, of a deep green colour; the flower-stem, which comes from the center of the root, is naked, and rarely rises more than eight or nine inches high, having five or six greenish-yellow flowers, growing almost in the form of an umbel at top: these are rarely succeeded by seeds in Britain.

Culture. The Canada albuca is hardy; so the roots may be planted about four inches deep in a border of light earth, where they will thrive and produce their flowers late in the summer: but as the seeds do not often ripen in Britain, and the bulbs put out few offsets, the plants are not common in that country. The African sort generally flowers twice a-year; first in March or April, and again in July or August; and if its roots are kept in pots filled with light earth; sheltered under a hot-bed frame, they will flower even in winter; but the best method is to have a border in the front of a green-house, or stove, where the roots of most of the bulbous flowers may be planted in the full ground, and screened in winter from frost: in such situations they thrive much better, and flower stronger, than when kept in pots.

ALBUGINEA TUNICA, in anatomy, the third or innermost coat or covering of the testes; it is likewise the name given to one of the coats of the eye.

ALBUGINEUS, in anatomy, a term sometimes applied to the aqueous humour of the eye.

ALBUGO, or LEUCOMA, in medicine, a distemper occasioned

occasioned by a white opaque spot growing on the *cornea* of the eye, and obstructing vision. See MEDECINE (Index).

ALBUM, in antiquity, a kind of white table, or register, wherein the names of certain magistrates, public transactions, &c. were entered. Of these there were various sorts; as the *album decurionum, album senatorum, album judicum, album prætoris, &c.*

ALBUM Decurionem, was the register wherein the names of the *decuriones* were entered. This is otherwise called *matriculatio decurionum.*

ALBUM Senatorum, the list of senators names which was first introduced by Augustus, and renewed yearly.

ALBUM Judicum, that wherein the names of the persons of those *decuriæ* who judged at certain times, were entered.

ALBUM Prætoris, that wherein the *formulæ* of all actions, and the names of such judges as the prætor had chosen to decide causes, were written.

The high-priest entered the chief transactions of each year into an album, or table, which was hung up in his house for the public use.

ALBUM is also used, in later times to denote a kind of table, or pocket-book, wherein the men of letters with whom a person has conversed, inscribe their names with some sentence or motto.—The famous Algernon Sydney being in Denmark, was by the university of Copenhagen presented with their *album,* whereupon he wrote these words:

——Manus hæc inimica tyrannis
Ense petit placidam sub libertate quietem.

ALBUM Græcum, among physicians, the white dung of dogs, formerly prescribed for inflammations of the throat, &c. but now justly despised.

ALBUMAZAR, a learned Arabian astronomer in the tenth century, who wrote a treatise, *Of the Revolution of the Years.*

ALBUMEN, the white of an egg. For its nature, origin, and office, see EGG.

The white of an egg, according to Boerhaave, makes an extraordinary menstruum. Being boiled hard in the shell, and afterwards suspended in the air by a thread, it resolves and drops down into an insipid, scentless, liquor, which appears to be that anamolous unaccountable menstruum so much used by Paracelsus; and will, though it contain nothing sharp, oleaginous, or saponaceous, make a thorough solution of myrrh; which is more than either water, oil, spirits, or even fire itself, can effect.

A little putrid white of egg taken into the stomach, occasions a nausea, horror, fainting, vomiting, diarrhœa. and gripes; it inflames the bile, excites heat, thirst, fever; and dissolves the humours like the plague. On the contrary, the white of fresh-laid eggs, if taken while warm from the hen, is extremely nourishing to the infirm: it may be taken in luke warm milk: but if any other heat is applied to it, the nutritious quality will be destroyed. The fresh white of egg prevents burns from rising in blisters, if it is used immediately after the accident: it mitigates inflammations of the eyes, and preserves the face from sun-burning. In pharmacy, it is used as a medium to render balsams and turpentines, &c. miscible with aqueous fluids; but as it disagrees with many stomachs when thus taken, a mucilage of gum arabic may supply its place, it being as good a medium in similar circumstances, and not apt to offend the tenderest stomach.—Whites of eggs are also useful for clarifying liquors; to which purpose, being mixed and incorporated with the liquors to be clarified, and the whole afterwards boiled, the whites of eggs are by this means brought together and hardened, and thus carry off the gross parts of the liquor along with them.

ALBUQUERQUE, a small city in Spain, in the province of Estremadura, is seated on an eminence, nine miles from the frontiers of Portugal. It is commanded by an almost impregnable fortress, built on a high mountain, and serving to defend the town. It carries on a great trade in a wool and woollen manufactures. It was taken by the allies of Charles king of Spain, in 1705. W. Long. 7. 0. N. Lat. 38. 52.

ALBURN, the English name of a compound colour, being a mixture of white and red, or reddish brown. Skinner derives the word, in this sense, from the Latin *albus,* and the Italian *burno,* from *bruno,* brown.

ALBURNUM, the soft white substance which in trees is found between the liber or inner bark and the wood, and in progress of time acquiring solidity, becomes itself the wood. From its colour and comparative softness, it has been styled by some writers the fat of trees *adeps arborum.*

The alburnum is found in largest quantities in trees that are vigorous; though in such as languish, or are sickly, there is a great number of beds. In an oak six inches in diameter, this substance is nearly equal in bulk to the wood. In a trunk of one foot diameter, it is as one to three and a half; of two and a half feet diameter, as one to four and a half, &c. but these proportions vary according to the health and constitution of the trees.—The alburnum is frequently gnawed in pieces by insects which lodge in the substance, and are nourished from it.

ALBURNUS, in zoology, a species of the *cyprinus* of Linnæus. See CYPRINUS.

ALCA, or AUK, in ornithology, a genus of the order of anseres. The beak of this genus is without teeth, short, convex, compressed, and frequently furrowed transversely; the inferior mandible is gibbous near the base; the feet have generally three toes. The species of the alca are 12; of which the most remarkable are,

1. The impennis, northern penguina, or great auk, with a compressed bill furrowed on each side, and an oval spot on each side of the eyes. According to Mr Martin, this bird breeds on the isle of St Kilda; appearing there the beginning of May, and retiring the middle of June. It lays one egg, which is six inches long, of a white colour; some are irregularly marked with purplish lines crossing each other, others blotched with black, and ferruginous about the thicker end: if the egg is taken away, it will not lay another that season. Mr Macaulay informs us that it does not visit that island annually, but sometimes keeps away for several years together; and adds, that it lays its egg close to the sea-mark, being incapable, by reason of the shortness of its wings, to mount higher. The length of this bird, to the end of its toes, is three feet; but its wings are so small, as to be useless for flight; the length, from the tip of the longest quill-feathers to the

the first joint, being only four inches and a quarter. This bird is observed by seamen never to wander beyond soundings; and according to its appearance they direct their measures, being then assured that land is not very remote. It sometimes frequents the coasts of Norway, the Ferroe isles, Iceland, Greenland, and Newfoundland; and feeds much on the lump-fish, father-lasher, and other fish of that size. The young birds eat rose-root, and other plants. The old ones are very rarely seen on shore, tho' the young ones are not unfrequently met with. It is a very shy bird. It walks ill; but dives well, and is taken in the manner used for the razor-bill and puffin. The skin between the jaws is blown into a bladder, and used for the darts of the Greenlanders, as is also that of some other birds. The skin of the body is supposed to be used by the Esquimaux Indians for garments.

2. The alle, little auk, or black and white diver, with a smooth conical bill, a white streak on the belly and wings, and black feet. The bulk of this species exceeds not that of a black-bird. It is not very common in Britain, being only met with now and then. It seems to be most plentiful towards the north, being met with in various parts as far as Spitzbergen. It is common in Greenland, in company with the black-billed species; feeds on the same food; and lays two blueish white eggs, larger than those of a pigeon. It flies quick, and dives well; and is always dipping its bill into the water while swimming or at rest on the water. It grows fat in the stormy season, from the waves bringing plenty of crabs and small fish within its reach; but from its size it is less sought after than the others. In Greenland it is called the *Ice-bird*, being the harbinger of Ice. This species is sometimes seen of a pure white.

3. The arctica, or puffin, with a compressed bill and four furrows; the orbit of the eyes and temples are white. The legs of this species are very small; and placed so far behind as to disqualify it from standing, except quite erect, resting not only on the foot, but the whole length of the leg. This circumstance * makes the rise of the puffin from the ground very difficult, and it meets with many falls before it gets on wing; but when that is effected, few birds fly longer or stronger. These birds frequent the coasts of several parts of Great Britain and Ireland; but no place in greater numbers than Priestholm isle, where their flocks may be compared to swarms of bees for multitude. These are birds of passage; they resort there annually about the fifth or tenth of April, quit the place (almost to a bird), and return twice or thrice before they settle to burrow and prepare for ovation and incubation. They begin to burrow the first week in May; but some few save themselves that trouble, and dislodge the rabbits from their holes, taking possession of them till their departure from the isle. Those which form their own burrows, are at that time so intent on the work as to suffer themselves to be taken by the hand. This task falls chiefly to the share of the males; who also assist in incubation. The first young are hatched the beginning of July. The old ones show vast affection towards them; and seem totally insensible of danger in the breeding season. If a parent is taken at that time, and suspended by the wings, it will in a sort of despair treat itself most cruelly, by biting every part it can reach; and the moment it is loosed, will never offer to escape, but instantly resort to its unfledged young: this affection ceases at the stated time of migration, which is most punctually about the 11th of August, when they leave such young as cannot fly to the mercy of the peregrine falcon, who watches the mouths of the house for the appearance of the little deserted puffins, which, forced by hunger, are compelled to leave their burrows. They lay only one egg. The eggs differ much in form: some have one end very acute; others have both extremely obtuse; all are white. Their flesh is excessively rank, as they feed on sea-weeds and fish, especially sprats: but when pickled and preserved with spices, are admired by those who love high-eating. Dr Caius tells, that, in his days, the church allowed them in lent, instead of fish: he also acquaints us, that they were taken by means of ferrets, as we take rabits: at present, they are either dug out, or drawn from their burrows by a hooked stick: they bite extremely hard, and keep such fast hold on whatever they fasten, as not to be easily disengaged. Their noise when taken, is very disagreeable; being like the efforts of a dumb person to speak. These birds are also common in Ireland; on the island Sherries, three leagues N. N. W. of Holyhead; and in the S. Stack, near Holyhead, they breed in plenty. They inhabit Iceland and Greenland; and breed in the extreme parts of the islands. It is also found in the Ferroe isles, where it is called *Lunda*; and in the Farn isles, where it is called *Coulter-neb*, from the shape of the bill. It goes also by various other names; such as *Gulden-head*, *Bottle-nose*, and *Helegug*, in Wales; at Scarborough, *Mullet*; and in Cornwall, *Pope*. In America they are said to frequent Carolina in winter; and have been met with in Sandwich Sound by late voyagers: the natives ornament the fore parts and collar of their seal-skin jackets with the beaks of them; and those of Aoonalashka wear gowns of their skins, along with those of other birds. On the coast of Kamtschatka and the Kurulschi islands they are common, even on the Penschinski bay, almost as far as Ochotka: the nations of the two first wear the bills about their necks fastened to straps; and according to the superstition of these people, their shaman or priest must put them on with a proper ceremony, in order to procure good fortune.

4. The torda, or razor-bill, with four furrows on the bill and a white line on each side running from the bill to the eyes. These birds, in company with the guillemot, appear in the British seas the beginning of February; but do not settle on their breeding places till they begin to lay, about the beginning of May. They inhabit the ledges of the highest rocks that impend over the sea, where they form a grotesque appearance; sitting close together, and in rows one above another. They properly lay but one egg a-piece, of an extraordinary size for the bulk of the bird, being three inches long: it is either white, or of a pale sea-green, irregularly spotted with black: if this egg is destroyed, both the auk and the guillemot will lay another; if that is taken, then a third; they make no nest, depositing their egg on the bare rock; and though such multitudes lay contiguous, by a wonderful instinct each distinguishes its own. What is also matter of great amazement, they fix their egg on the smooth rock, with so exact a balance, as to secure it from rolling off; yet should

* It attends every one of the genus.

Alca. should it be removed, and then attempted to be replaced by the human hand, it is extremely difficult, if not impossible, to find its former equilibrium. According to Mr Latham, it is by means of a cement that the bird fixes its egg. The eggs are food to the inhabitants of the coasts they frequent; which they get with great hazard; being lowered from the top by ropes, trusting to the strength of their companions, whose footing is often so unstable that they are forced down the precipice, and perish together. These birds are found in the north of Europe, also in Iceland, Greenland, and on the coast of Labrador. In Europe they extend along the White Sea into the Arctic Asiatic shores, and from thence to Kamtschatka and the gulph of Oschotka: It is the only one that reaches the inland Baltic; being found there on the Carls-Ozar isles, near Gothland, and the island of Bondon off Angermania.

5. The pica, or black-billed auk, has the bill of the same form with the torda, but is entirely black. The cheeks, chin, and throat, are white: in all other respects it agrees with the former species. Mr Latham is of opinion that it is no other than the young of that species. Mr Pennant observes, that it is sometimes found on our coasts; but, according to Mr Latham, it is in the winter season only, when the common sort has quitted them. They are said to be met with on the coast of Candia and other parts of the Mediterranean; "where, no doubt (Mr Latham observes) the complete old bird is likewise found, as I have been informed that they are common in the bay of Gibraltar, where it is curious to see their activity under water when pursuing the fish; for, as the water in the bay is sometimes clear for a great depth from the surface, these birds may be often seen as it were flying after their prey, with all the agility of a bird in the air, turning in every direction after the fish, with such wonderful address and dexterity as seldom to miss their aim."

6. The cirhata of Dr Pallas, or tufted auk, somewhat bigger than the common puffin, and the colours much the same: the bill is an inch and three-quarters in length, the same in depth at the base, and crossed with three furrows: over each eye arises a tuft of feathers four inches in length, which falls elegantly on each side of the neck, reaching almost to the back; and are white as far as they are attached to the head, but afterwards of a fine buff yellow: the legs are of a bright red; the claws black. The female is principally distinguished by having the bill crossed only with two furrows instead of three. This species inhabits the shores of Kamtschatka, the Kurile islands, and those intervening between Kamtschatka and America. In manners it greatly resembles the puffin; living all day at sea, but at no great distance from the rocks; it comes on shore at night; burrows a yard deep under ground, and makes a nest, with feathers and sea-plants; is monogamous, and lodges there the whole night with its mate. It lays one white egg, the end of May or beginning of June, which alone is thought fit to be eaten, the flesh of the bird itself being insipid and hard. It feeds on crabs, shrimps, and shell-fish, which last it forces from the rocks with its strong bill. Pallas remarks, that the Kamtschatkan girls imitate the tufts of these birds, which nature has supplied them with, by placing a similar strip of the white skin of the glutton behind each ear, hanging down behind by way of ornament; and is a well-received present from a lover to his mistress. The bills both of this and the common puffin were formerly held by the natives as a charm, and worn by the priests as amulets; indeed at the present these have been seen fixed round their head dresses, but supposed now to be only esteemed as mere ornaments: the skins are however made use of for clothing, being sewed together. It is called in Kamtschatka, *Muechagatka*; and in Oschotka, *Igilma*.

7. The psittacula, or perroquet auk, of Dr Pallas, is about the size of the little auk. The bill is much compressed on the sides, in shape convex both above and below, and of a bright red colour: from the remote corner of each eye is a very slender tuft of fine white feathers, hanging down the neck: the head and upper part of the body are dusky; the lower whitish, varied with black edges: the legs are of a dirty yellow; and the webs dusky. This species is found at Kamtschatka, in the isles towards Japan, and on the western shores of America. They are sometimes seen in flocks, but seldom far from land, except driven by storms. Of nights they harbour in the crevices of rocks. They lay an egg almost the size of a hen's, of a dirty white or yellowish colour spotted with brown; which they do about the middle of June, upon the bare rock or sand, for they make no nest. Like most of the tribe, they are stupid birds, as may be evinced by the ridiculous method of catching them:—One of the natives places himself under a loose garment of fur, of a particular make, with large open sleeves, among the rocks, at evening; when the birds, returning to their lodging places at dusk, run under the skirts, and up the arm-holes, for shelter during the night; and thus become an easy prey. Their stupidity likewise occasions them to fly aboard a ship at such times, mistaking it for a roosting-place; whereby navigators have been taught to avoid the danger of falling in too near with land, either of evenings, or on approaching storms. The eggs are esteemed good.

Alcæus. ALCÆUS, a famous ancient lyric poet, born at Mitylene, in the island of Lesbos. Horace seems to think him the inventor of this kind of poesy:

> Now the Roman muse inspire,
> And warm the song with Grecian fire. *Francis.*

He flourished in the 44th Olympiad, at the same time with Sappho, who was likewise of Mitylene. Alcæus was a great enemy to tyrants, but not a very brave soldier. He was present at an engagement, wherein the Athenians gained a victory over the Lesbians; and here, as he himself is said to have confessed in one of his pieces, he threw down his arms, and saved himself by flight. Horace, who, of all the Latin poets, most resembled Alcæus, has made the like confession:

> With thee I saw Philippi's plain,
> Its fatal rout, a fearful scene!
> And dropp'd, alas! th' inglorious shield,
> Where valour's self was forc'd to yield;
> Where soil'd in dust the vanquish'd lay,
> And breath'd th' indignant soul away. *Francis.*

The poetical abilities of Alcæus are indisputed; and though

though his writings were chiefly in the lyric ſtrain, yet his muſe was capable of treating the ſublimeſt ſubjects with a ſuitable dignity. Hence Horace ſays,

Alcæus ſtrikes the golden ſtrings,
And ſeas, and war, and exile ſings.
Thus while they ſtrike the various lyre,
The ghoſts the ſacred ſounds admire:
But when Alcæus lifts the ſtrain
To deeds of war and tyrants ſlain,
In thicker crowds the ſhadowy throng
Drink deeper down the martial ſong. *Francis.*

Alcæus, an Athenian tragic poet, and, as ſome think, the firſt compoſer of tragedies. He renounced his native country Mitylene, and paſſed for an Athenian. He left ten pieces, one of which was Paſiphaë, that which he produced when he diſputed with Ariſtophanes, in the fourth year of the 97th Olympiad.

There is another Alcæus mentioned in Plutarch, perhaps the ſame whom Porphyrius mentions as a compoſer of ſatirical iambics and epigrams, and who wrote a poem concerning the plagiariſm of Euphorus the hiſtorian. He lived in the 145th Olympiad.

We are told likewiſe of one Alcæus, a Meſſenian, who lived in the reign of Veſpaſian and Titus. We know not which of theſe it was who ſuffered for his lewdneſs a very ſingular kind of death, which gave occaſion to the following epitaph:

Ἀλκαιου ταφος ουτος, &c.

This is Alcæus's tomb; who died by a radiſh,
The daughter of the earth, and puniſher of Adulterers.

This puniſhment inflicted on adulterers, was thruſting one of the largeſt radiſhes up the anus of the adulterer: or, for want of radiſhes, they made uſe of a fiſh with a very large head, which Juvenal alludes to:

Quoſdam mœchos et mugilis intrat. *Sat.* x.
The mullet enters ſome behind.

Hence we may underſtand the menace of Catullus.

Ah! tum te miſerum, maliquæ fati,
Quem attractis pedibus, patente porta,
Percurrent raphanique magileſque. *Epig.* xv.
Ah! wretched thou, and born to luckleſs fate,
Who art diſcover'd by the unſhut gate!
If once, alas! the jealous huſband come,
The radiſh or the ſea-fiſh is thy doom.

ALCAICS, in ancient poetry, a denomination given to ſeveral kinds of verſe, from Alcæus, their inventor.

The firſt kind conſiſts of five feet, viz. a ſpondee, or iambic; an iambic; a long ſyllable; a dactyle; another dactyle: ſuch is the following verſe of Horace,

Omnes | eo|dem cogimur, | omnium
Verſa|tur ur|na | ſerius | ocyus|
Sors exitura.

The ſecond kind conſiſts of two dactyles and two trochees: as,

Exili|um impoſi|tura | cymbæ.

Beſides theſe two, which are called *dactylic Alcaïcs*, there is another ſtyled ſimply *Alcaic*; conſiſting of an epitrite; a choriambus; another choriambus; and a bacchius: the following is of this ſpecies,

Cur timet fla|vum Tiberim tan|gere, cur | olivum?

Alcaic Ode, a kind of manly ode compoſed of ſeveral ſtrophes, each conſiſting of four verſes; the two firſt of which are always Alcaïcs of the firſt kind; the third verſe is a diameter hypercatalectic, or conſiſting of four feet and a long ſyllable; and the fourth verſe is an Alcaïc of the ſecond kind. The following ſtrophe is of this ſpecies, which Horace calls *minaces Alcæi camenæ.*

Non poſſidentem multa vocaveris
Recte beatum: rectius occupat
Nomen beati, qui deorum
Muneribus ſapi enter uti, &c.

ALCAID, Alcayde, or Alcalde, in the polity of the Moors, Spaniards, and Portugueſe, a magiſtrate, or officer of juſtice, anſwering nearly to the French provoſt, and the Britiſh juſtice-of-peace.—The alcaid among the Moors is veſted with ſupreme juriſdiction, both in civil and criminal caſes.

ALCALA de Guadeira, a ſmall town of Spain, in Andaluſia, upon the river Guadeira. Here are abundance of ſprings, from whence they convey water to Seville by an aqueduct. W. long. 6. 16. N. lat. 37. 15.

Alcala de Henares, a beautiful and large city of Spain, in New Caſtle, ſeated upon the river Henares, which waſhes its walls. It is built in a very agreeable plain, and is of an oval figure. The ſtreets are handſome and pretty ſtraight; one of them is very long, running from one end of the city to the other. The houſes are well built; and there are ſeveral ſquares, the largeſt of which is an ornament to the city; it is ſurrounded on all ſides with piazzas, where tradeſmen have their ſhops to expoſe ſeveral ſorts of commodies to ſale, of which there is a great plenty and variety as in moſt towns of Spain. The univerſity was founded by cardinal Ximenes, archbiſhop of Toledo, about the beginning of the 16th century. The land about Alcala is watered by the Henares, well cultivated, and very fruitful, while that at a diſtance is dry and ſterile: it yields grain in plenty, very good muſcat wine, and melons of a delicious kind. Without the walls is a ſpring, the water of which is ſo pure and ſo well taſted, that it is incloſed and ſhut up for the king of Spain's own uſe, from whence it is carried to Madrid.—This city is 10 miles ſouth-weſt of Guadalaxara, and 13 miles eaſt of Madrid. W. Long. 4. 20. N. Lat. 40. 30.

Alcala-Real, a ſmall city of Spain, in Andaluſia, with a fine abbey. It is built on the top of a high mountain, in a mountainous country; and the road to it is incommodious, rough, and unequal; but to make amends for this, here are ſeveral kinds of exquiſite fruit and wine. W. Long. 4. 15. N. Lat. 37. 18.

ALCALY, or Alcali, or Alkali. See Chemistry, *Index*.

ALCANIS, a town of Arragon in Spain, ſeated on the river Gaudaloup, twelve miles from Caſpe. It was formerly the capital of the kingdom of the Moors; but being taken from them, it was made a commendary of the order of Calatrava. Here is a very remarkable fountain, which throws up water through 42 pipes. It is ſurrounded with gardens and fruit-trees, and defended with a good fortreſs. W. Long. 0. 5. N. Lat. 41. 0.

ALCANNA, in commerce, a powder prepared from the

the leaves of the Egyptian privet, in which the people of Cairo drive a considerable trade. It is much used by the Turkish women to give a golden colour to their nails and hair. In dyeing, it gives a yellow colour when steeped with common water, and a red one when infused in vinegar. There is also an oil extracted from the berries of alcanna, and used in medicine as a calmer.

ALCANTARA, a small, but very strong city of Estremadura, in Spain. It gives name to one of the three others of knighthood. It is seated on the banks of the Tajo, or Tagus, 21 miles from Coria, in a very fruitful soil, and is celebrated for its bridge over that river. This was built in the time of the emperor Trajan, as appears by an inscription over one of the arches, by the people of Lusitania, who were assessed to supply the expence. It is raised 200 feet above the level of the water; and though it consists but of six arches, is 670 feet in length, and 28 in breadth. At the entrance of the bridge, there is a small antique chapel hewn in a rock by the ancient Pagans, who dedicated it to Trajan, as the Christians did to St Julian. This city was built by the Moors, on account of the convenience of this bridge; which is at a place where the Tajo is very deep, running between two high steep rocks: for this reason, they called it *Al-Cantara*, which, in their language, signifies *the Bridge*. It was taken from them in 1214, and given to the knights of *Calatrava*, who afterwards assumed the name of *Alcantara*. It was taken by the Earl of Galloway, in April, 1706, and retaken by the French in November following. It is 45 miles from Madrid, and 125 from Seville. W. Long. 7. 12. N. Lat. 39. 30.

Knights of ALCANTARA, a military order of Spain, which took its name from the abovementioned city. They make a very considerable figure in the history of the expeditions against the Moors. The knights of Alcantara make the same vows as those of Calatrava, and are only distinguished from them by this, that the cross fleur de lys, which they bear over a large white cloak, is of a green colour. They possess 37 commanderies. By the terms of the surrender of Alcantara to this order, it was stipulated, that there should be a confraternity between the two orders, with the same practices and observances in both; and that the order of Alcantara should be subject to be visited by the grand-master of Calatrava. But the former soon released themselves from this engagement, on pretence that their grand-master had not been called to the election of that of Calatrava, as had been likewise stipulated in the articles. After the expulsion of the Moors, and the taking of Granada, the sovereignty of the order of Alcantara and that of Calatrava was settled in the crown of Castile by Ferdinand and Isabella.—In 1540, the knights of Alcantara sued for leave to marry, which was granted them.

ALCAREZ, a small city of La Mancha, in Spain, defended by a pretty strong castle, and remarkable for an ancient aqueduct. It stands near the river Guardamana, and the soil about it is very fruitful. They have a breed of little running-horses, which are very fleet and strong. It is 25 miles north of the confines of Andalusia, 108 south of Cuenza, and 130 south-by-east of Madrid. W. Long. 1. 50. N. Lat. 38. 28.

ALCASSAR DO SAL, a town of Portugal, in Estremadura, which has a castle said to be impregnable. It is indeed very strong, both by art and nature, being built on the top of a rock which is exceedingly steep on all sides. Here is a salt-work which produces very fine white salt, from whence the town takes its name. The fields produce large quantities of a sort of rushes, of which they make mats, which are transported out of the kingdom. W. Long. 9. 10. N. Lat. 38. 18.

ALCASSAR, a city of Barbary, seated about two leagues from Larache, in Asga, a province of the kingdom of Fez. It was of great note, and the seat of the governor of this part of the kingdom. It was built by Jacob Almanzor, king of Fez, about the year 1180, ane designed for a magizine and place of rendezvous for the great preparations he was making to enter Granada in Spain, and to make good the footing Joseph Almanzor had got some time before. It is said his father first invaded Spain with 300,000 men, most of whom he was obliged to bring back to Africa to quiet a rebellion that had broke out in Morocco. This done, he returned to Spain again with an army, as is said, of 200,000 horse and 300,000 foot. The city is now fallen greatly to decay, so that of fifteen mosques there are only two that they make use of. The reason, probably, is the bad situation of the town; for it stands so low, that it is excessively hot in summer, and almost overflowed with water in the winter. This they affirm to be owing to a curse of one of their saints. Here are a great number of storks, who live very familiarly with the people, walking about the town, possessing the tops of the houses and mosques without molestation; for they esteem them sacred birds, and account it sinful to disturb them. At present, the bashaw of Tetuan appoints a governor to this town, which is the last of his dominions towards Mequinez. Near this city there is a high ridge of mountains, running towards Tetuan, whose inhabitants were never brought entirely under subjection; and whenever it was attempted, they revenged themselves by infesting the roads, and robbing and destroying the travellers. When they were pursued, they retired into their woody mountains, where none could safely follow them. Not far from hence is the river Elmahassen, famous for the battle fought between Don Sebastian king of Portugal and the Moors; in which the Portuguese were defeated and their king slain. W. Long. 12. 35. N. Lat. 35. 15.

ALCAVALLA, in the Spanish finances, was at first a tax of ten per cent. afterwards of fourteen per cent. and is at present of only six per cent. upon the sale of every sort of property, whether moveable or immoveable; and it is repeated every time the property is sold. The levying of this tax requires a multitude of revenue-officers sufficient to guard the transportation of goods, not only from one province to another, but from one shop to another. It subjects not only the dealers in some sort of goods, but those in all sorts, every farmer, every manufacturer, every merchant and shopkeeper, to the continual visits and examination of the tax-gatherers. Through the greater part of a country in which a tax of this kind is established, nothing can be produced for distant sale. The produce of every part of the country must be proportioned to the consumption of the neighbourhood. It is to the Alcavala, accordingly, that Ustaritz imputes the ruin of the manufactures of Spain. He might have imputed to it likewise the declension of agriculture, it being imposed not only upon manufactures, but upon the rude produce of the land.

ALCAZAR LEGUER, a town of Africa, in the kingdom of Fez, and in the province of Habat. It was taken by Alphonso, king of Portugal, in 1468; but soon after that, it was abandoned to the Moors. It is seated on the coast of the straits of Gibraltar. W. Long. 5. 30. N. Lat. 38. 0.

ALCAZER, a town of Spain, in New Castile, seated on the river Guardamana, which has a fortress on a high hill for its defence, and lies in a very fruitful country. It is 100 miles north-west of Carthagena. W. Long. 2. 10. N. Lat. 38. 15.

ALCE, ALCES, or ELK, in zoology, the trivial name of a species of the cervus, belonging to the order of mammalia pecora. See CERVUS.

ALCEA, the HOLLY-HOCK: A genus of the polyandria order, belonging to the monodelphia class of plants; and in the natural method ranking under the 37th order, *Columniferæ*. The characters are: The *calyx* is a double perianthium, monophyllous and persistent; the exterior one six-cleft, the interior half five-cleft: The *corolla* consists of five petals, coalesced at the base, heart-shaped inversely, and expanding: The *stamina* consist of numerous filaments, coalesced below into a five-cornered cylinder, loose above, and inserted into the corolla; the antheræ are kidney-shaped: The *pistillum* has a roundish germen; a short cylindric stylus: and numerous bristly stigmata the length of the stylus: The *pericarpium* consists of many arilli, jointed into a verticillum about a columnar depressed receptacle: The *seeds* are solitary, reniform, and depressed.

Species. Although Linnæus mentions two distinct species of this genus, viz. the *rosea* and *ficifolia*, he thinks, that the latter may perhaps be only a variety of the former; but Mr Miller affirms them to be distinct species, whose difference in the form of their leaves always continues. The leaves of the first sort are roundish, and cut at their extremities into angles; those of the second are deeply cut into six or seven segments, so as to resemble a hand. Cultivation produces almost an infinite variety of this plant, such as double-flowered, single-flowered, deep red, pale red, blackish red, white, purple, yellow, and flesh-colour. The first species is a native of China, the second grows also in Istria. Tho' natives of warm countries, they are hardy enough to thrive in the open air in Britain, and have for many years been some of the greatest ornaments in gardens, towards the end of summer; but they have the inconvenience of growing too large for small gardens, and requiring tall stakes to secure them from being broken by strong winds. In large gardens, however, when properly disposed, they make a fine appearance; for as their spikes of flowers grow very tall, there will be a succession of them on the same stems more than two months: the flowers on the lower part of the spike appear in July; and as their stalks advance, new flowers are produced till near the end of September. When planted in good ground, the stalks will often rise to the height of eight or nine feet; so that near six feet of each will be garnished with flowers, which, when double and of good colours, make a very beautiful appearance.

Culture. The holly-hock is propagated by seeds, which should be carefully saved from those plants whose flowers are double and of the best colours: for though the duplicity of the flowers, as well as their colour, are only accidental properties, yet the young plants will produce nearly the same kind of flowers with those from which the seeds are taken, provided no plants with single or bad-coloured flowers are permitted to grow near them; and as soon as such appear they ought to be removed from the good ones, that their farina may not spread into the others, which would cause them to degenerate. The seeds ought to be gathered very dry, and remain in their capsules until spring; but care must be taken that no wet comes to them in winter, otherwise the covers would turn mouldy, and spoil their contents.—They should be sown in drills, about the middle of April, on a bed of light earth, and covered with earth of the same kind about half an inch deep. When the plants have put out six or eight leaves, they should be transplanted into nursery-beds, observing to water them until they have taken good root; after which they will require no farther care, but to keep them clean from weeds till October, when they should be transplanted where they are to remain.

ALCEDO, or KINGSFISHER, in ornithology, a genus of the order of picæ. The alcedo has a long, strait, thick, triangular bill; with a fleshy, plain, short, flat tongue.

Of this genus there are a great many species, with one or other of which almost every part of the world is furnished. Most of them frequent rivers, and live on fish, the singularity of catching which is admirable: sometimes hovering over the water, where a shoal of small fishes is seen playing near the surface; at other times waiting with attention, on some low branch hanging over the water, for the approach of a single one who is so unlucky as to swim that way; in either case dropping like a stone, or rather darting with rapidity on his prey; when, seizing it crosswise in his bill, it retires to a resting place to feast on it; which it does piecemeal, bones and all, without reserve, afterwards bringing up the indigestible parts in pellets, like birds of prey. The wings of most of the genus are very short; yet the birds fly rapidly, and with great strength. It may be remarked, that throughout this genus, blue, in different shades, is the most predominant colour.—The species found in the South Sea Islands are held in a kind of superstitious veneration by the natives of the places they severally inhabit, perhaps on account of their being frequently seen flying about the morais or burial-places. That which inhabits Otaheite, where it is called *Erooro*, is accounted particularly sacred, and not allowed to be taken or killed.

1. The ispida, or common kings-fisher, is not much larger than a swallow; its shape is clumsy; the bill disproportionably long; it is two inches from the base to the tip; the upper chap black, and the lower yellow. But the colours of this bird atone for its inelegant form: the crown of the head and the coverts of the wings are of a deep blackish green, spotted with bright azure: the back and tail are of the most resplendent azure; the whole under-side of the body is orange-coloured; a broad mark of the same passes from the bill beyond the eyes; beyond that is a large white spot; the tail is short, and consists of twelve feathers of a rich deep blue;

Alcedo. blue; the feet are of a reddish yellow, and the three joints of the outmost toe adhere to the middle toe, while the inner toe adheres only by one.

From the diminutive size, the slender short legs, and the beautiful colours of this bird, no person would be led to suppose it one of the most rapacious little animals that skims the deep. Yet it is forever on the wing, and feeds on fish; which it takes in surprising quantities, when we consider its size and figure. It takes its prey after the manner of the osprey, balancing itself at a certain distance above the water for a considerable space, then darting into the deep, and seizing the fish with inevitable certainty. While it remains suspended in the air, in a bright day, the plumage exhibits a beautiful variety of the most dazzling and brilliant colours. This striking attitude did not escape the notice of the ancients; for Ibycus, as quoted by Athenæus, styles these birds αλκυονες τανυσιπτεροι, the halcyons with expanded wings. It makes its nest in holes in the sides of the cliffs, which it scoops to the depth of three feet; and lays from five to nine eggs, of a most beautiful semitransparent white. The female begins to lay early in the season, and excludes her first brood about the beginning of April. The male, whose fidelity exceeds even that of the turtle, brings her large provisions of fish while she is thus employed; and she, contrary to most other birds, is found plump and fat at that season. The male, that used to twitter before this, now enters the nest as quietly and as privately as possible. The young ones are hatched at the expiration of 20 days; but are seen to differ as well in their size as in their beauty.

This species is the αλκυωναφωνος, or mute halcyon of Aristotle, which he describes with more precision than is usual with that great philosopher. After his description of the bird follows that of its nest; than which the most inventive of the ancients have delivered nothing that appears at first sight more fabulous and extravagant. He relates, that it resembled those concretions that are formed by the sea-water; that it resembled the long-necked gourd; that it was hollow within; that the entrance was very narrow, so that, should it overset, the water could not enter; that it resisted any violence from iron, but could be broke with a blow from the hand; and that it was composed of the bones of the Βελονη, or sea-needle. The nest had medical virtues ascribed to it; and from the bird was called *Halcyoneum*. In a fabulous age, every odd substance that was flung ashore received that name; a species of tubular coral, a sponge, a zoophite, and a miscellaneous concrete, having by the anciens been dignified with that title from their imaginary origin*. Yet much of this seems to be founded on truth. The form of the nest is justly described; and the materials which Aristotle says it was composed of, are not entirely of his own invention. Whoever has seen the nest of the kings-fisher, will observe it strewed with the bones and scales of fish; the fragments of the food of the owner and its young.—On the foundation laid by the philosopher, succeeding writers formed other tales extremely absurd; and the poets, indulging the powers of imagination, dressed the story in all the robes of romance. This nest was a floating one:

* Plin. lib. xxxii. c. 8. Diosc. lib. v. c. 94.

Incubat *halcyone* pendentibus æquore nidis.
Ovid. Met. lib. xi.

It was therefore necessary to place it in a tranquil sea, and to supply the bird with charms to allay the fury of a turbulent element during the time of its incubation; for it had, at that season, power over the seas and the winds.

Χ' αλκυονες στορησευντι τα κυματα, τηντε θαλασσαν,
Τον τε νοτον, τον τ' ευρον, ος εσχατα φυκια κινει
Α'λκυονης, γλαυκαις Νηρηισι ταιτε μαλιστα
Ορνιθων εφιλαθεν. Theocrit. Idyl. vii. l. 57.

May *Halcyons* smooth the waves, and calm the seas,
And the rough south-east sink into a breeze;
Halcyons, of all the birds that haunt the main,
Most lov'd and honour'd by the *Nereid* train.
Fawkes.

These birds were equally favourites with Thetis as with the Nereids;

Dilectæ *Thetidi* Halcyones. Virg. Georg. I. 399.

as if to their influence these deities owed a repose in the midst of the storms of winter, and by their means were secured from those winds that disturb their submarine retreats, and agitated even the plants at the bottom of the ocean.

Such are the accounts given by the Roman and Sicilian poets. Aristotle and Pliny tell us, that this bird is most common in the seas of Sicily: that it sat only a few days, and those in the depth of winter; and during that period the mariner might sail in full security; for which reason they were styled *Halcyon days*.

Perque dies placidos hiberno tempore septem
Incubat *Halcyone* pendentibus æquore nidis:
Tum via tuta maris: ventos custodit, et arcet
Æolus egressu. Ovid. *Met.* lib. xi.

Alcyone, compress'd,
Seven days sits brooding on her watery nest,
A wintry queen; her sire at length is kind,
Calms every storm, and hushes every wind.
Dryden.

In after-times, these words expressed any season of prosperity: these were the *Halycon days* of the poets; the brief tranquillity, the *septem placidi dies*, of human life.

The poets also made it a bird of song. Virgil seems to place it in the same rank with the linnet;

Littoraque *Halyconem* resonant, et *Acanthida* dumi.
Georg. III. 338.

And Silius Italicus celebrates its music, and its floating nest:

Cum sonat *Halcyone* cantu, nidosque natantes
Immota gestat sopitis fluctibus unda. *Lib.* xiv. 275.

But these writers seem to have transferred to our species, the harmony that belongs to the *vocal alcedo* *, one of the lost birds of the ancients.

* Arist. Hist. an. 892.

As the ancients have had their fables concerning this bird, so have the modern vulgar. It is an opinion generally received among them, that the flesh of the kings-fisher will not corrupt, and that it will even banish all vermin. This has no better foundation than that which is said of its always pointing, when hung up dead, with its breast to the north. The only truth which can be affirmed of this bird when dead is, that its

its fleſh is utterly unfit to be eaten; while its beautiful plumage preſerves its luſtre longer than that of any other bird we know.

This bird is found not only in Britain, but throughout Europe, Aſia, and Africa; as ſpecimens have been received from both China, Bengal, and Egypt. Belon alſo remarks his having met with it in Romania and Greece; and Scopoli notices it as a bird of Carniola, where he ſays it remains the whole year as in England. Indeed it bears the rigours of the colder climates ſo well, that among the Germans it has gained the name of *Eiſzvogel* or *Ice Bird:* Olina ſpeaks alſo of its not regarding the ice and cold; and Gmelin aſſures us, that it is found even in Tartary and Siberia. But, however this may be, there are few winters in which many of theſe birds do not periſh, apparently from cold alone; as ſeveral have been found frozen ſtiff by the ſides of even running water, without the leaſt mark of violence about them. M. D'Aubenton has kept theſe birds for ſeveral months, by means of ſmall fiſh put into baſons of water, on which they have fed; for on experiment they have refuſed all other kinds of nouriſhment.

2. The rudis, or Egyptian kings-fiſher, as deſcribed by Haſſelquiſt, is the ſize of the Royſton crow. The bill is blackiſh, more than half an inch broad at the baſe, and two inches in length: the head, ſhoulders, and back, are brown, marked with oblong ferruginous ſpots: the throat is of a ferruginous white: the belly and thighs are whitiſh, marked with longitudinal broadiſh cinereous ſpots: upper tail coverts are quite white: the quills ſpotted with white on the inner webs, chiefly at the tips: the tail is aſh-coloured: the legs are of a pale green; and the claws blackiſh. It inhabits lower Egypt, about Cairo; builds in ſycamore and date trees; and feeds on frogs, inſects, and ſmall fiſh, which laſt it meets with in the fields when they are overflowed. Its cry is not unlike that of the common crow.

3. Le taparara of Buffon is about the ſize of a ſtarling. The upper mandible of the bill is black; the lower red: the hind part of the neck, the back, and ſcapulars, are of an elegant blue; the rump and upper tail coverts bright beryl-blue: the under parts of the body are white; the wing coverts blue; and the legs red. Inhabits Cayenne and Guiana, at which laſt place the natives call all the kings-fiſher tribe by the name *Taparara*. In this part of South America, which contains many rivers full of fiſh, kings-fiſhers, as might be expected, abound in vaſt numbers: but what is remarkable, they never herd together, always being found ſingle, except in breeding-time, which is about the month of September. They lay their eggs in the holes of banks, like the kings-fiſher of Europe. The cry of this bird imitates the word *Carac*.

4. The torqueta, or cinereous kings-fiſher, is about the ſize of a magpie, and fifteen inches and a half in length. The bill is three inches and a half long, and brown; the baſe of the lower mandible reddiſh: the head is creſted: the upper parts of the head and body are blueiſh aſh; the upper parts cheſnut: the throat is whitiſh, deſcending down the neck, and paſſing behind like a collar, ending towards the back in a point; the under tail coverts are of a pale fulvous, tranſverſely ſtriated with black: leſſer wing coverts varied with blueiſh, aſh, black, and yellowiſh: the legs are red; and the claws blackiſh. It inhabits Martinico and Mexico; at which laſt it is called *Achalalactli*. This bird migrates into the northern parts of Mexico at certain ſeaſons only, and is ſuppoſed to come there from ſome hotter parts.

[The jacamars are much allied to this genus, and have been ranked under it by Linnæus: Their toes are, however, differently placed; their food alſo is different, being inſects alone, and not fiſh; and their haunts are different, being moiſt woods, and not ſhores or the banks or rivers.]

5. The galbula, or green jacamar, is about the ſize of a lark. The bill is black, of a ſquare form, a little incurvated and ſharp at the point: the plumage in general, in the upper part of the body, is of a moſt brilliant green, gloſſed with copper and gold in different lights: the belly, throat, and vent, are rufous: the tail is compoſed of ten feathers, and ſhaped like a wedge: the legs are of a greeniſh yellow, very ſhort and weak; the claws are black. This ſpecies is found both in Guiana and Braſil, in the moiſt woods which it prefers to the more dry ſpots, for the ſake of inſects, on which it feeds. It is ſeldom ſeen except ſingle, as it is a very ſolitary bird, keeping for the moſt part in the thickeſt parts; its flight quick, but ſhort; perches on branches of a middling height, where it ſits all night, and frequently part of the day, without ſtirring. Though theſe birds are ſolitary, yet they are far from ſcarce, as many may be met with. They are ſaid to have a ſhort and agreeable note. The natives of Guiana call this bird *Venetore* and the Creoles, *Colibri des grands bois*. At Brazil their fleſh is eaten by ſome.

6. The paradiſea, or paradiſe jacamar, is of the ſame ſize with the former, and has a ſimilar bill: the throat, fore part of the neck, and under wing coverts, are white: the reſt of the plumage is of a deep dull green, in ſome lights appearing almoſt black, in other with a ſlight gloſs of violet and copper bronze: the tail is compoſed of twelve feathers of unequal lengths: the two middle ones longeſt: the legs are black; the toes are placed two before and two behind, and pretty much united. It inhabits Surinam; and like the others, it feeds on inſects; and ſometimes, contrary to them, frequents open places. It flies farther at a time, and perches on the tops of trees: It is frequently found with a companion, not being quite ſo ſolitary a bird as the other. It alſo differs in the note, having a kind of ſoft whiſtle often repeated, but not heard a great way off.

Above 30 other ſpecies have been deſcribed by ornithologiſts.

ALCHEMILLA, or LADIES-MANTLE: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 35th order *Senticoſæ*. The *calyx* is a ſingle-leav'd perianthium, tubular, and perſiſtent; the mouth flat, and eight-parted: There is no *corolla*. The *ſtamina* conſiſt of four ſmall erect ſubulated filaments placed in the mouth of the calyx; the antheræ are roundiſh: The *piſtillum* has an egg-ſhaped *germen*: The *ſtylus* is filiform, the length of the ſtamina, and inſerted at the baſe of the germ: The ſtigma is globular. There is no *pericarpium*, but the neck of the calyx cloſed. The *ſeed* ſolitary, elliptical, and compreſſed. Of this genus there are three

Species.

Species. 1. The vulgaris, or common ladies-mantle, with leaves plaited like a fan, and yellowish-green blossoms. It grows naturally in pasture-lands in most countries in Europe. The leaves discover to the taste a moderate astringency; and were formerly much esteemed in some female weaknesses, and in fluxes of the belly. They are now rarely made use of, tho' both the leaves and roots might doubtless be of service in cases where mild astringents are required. In the province of Smolandia in Gothland, they make a tincture of the leaves, and give it in spasmodic or convulsive diseases. Horses, sheep, and goats, eat it; cows are not fond of it; swine refuse it. —2. The alpina, or cinque-foil ladies-mantle, with finger-shaped sawed leaves, and greenish blossoms. It is a native of the mountainous parts of Europe. Goats and cows eat it; horses, sheep, and swine, refuse it.—3. The minor, or least ladies mantle, with five smooth leaves growing at a joint and cut into many segments. It grows naturally in Sweden, Lapland, and other cold countries. Eaten by cows and goats; refused by horses, sheep, and swine.

Culture. These plants have perennial roots, and annual stalks. They are easily propagated by parting of their roots, or sowing their seeds in autumn. They should have a moist soil and shady situation, and be kept clean from weeds; which is all the culture they require.

ALCHEMIST, a practitioner in alchemy.

ALCHEMY, that branch of chemistry which had for its principal objects the transmutation of metals into gold; the panacea, or universal remedy; an alkahest, or universal menstruum; an universal ferment; and many other things equally ridiculous.

Kircher, instructed in all the secrets of chemistry, has fully exposed the artifices and impostures of alchemists. An alchemist puts into a crucible the matter which is to be converted into gold; this he sets on the fire, blows it, stirs it with rods; and, after divers operations, gold is found at the bottom of the crucible, instead of the matter first put in: this there are a thousand ways of effecting, without any transmutation. Sometimes it is done by dexterously dropping in a piece of gold concealed between the fingers, sometimes by casting in a little of the dust of gold or silver disguised under the appearance of some elixir, or other indifferent matter; sometimes a crucible is used which has a double bottom, and gold put between the two; sometimes the rod used to stir the matter is hollow, and filled with the dust of the metal desired; at other times there is metal mixed with the charcoal, the ashes of the furnace, or the like. Mr Harris very properly distinguishes between alchemy and chemistry; and defines the former to be *ars sine arte, cujus principum est mentiri, medium laborare, et finis mendicare*; and the Italians have a proverb, *non ti fidiare al alchemista provero o medico amalato*. The ruin which has attended this delusion has occasioned several states to make severe laws against pretences to alchemy. The Romans formerly banished all such as professed it; and the sacred canons likewise directed the thunder of their censure against them. Dioclesian and Cæsar directed all books which treated of this subject to be burnt. Rymer furnishes us with a licence for practising alchemy, with all kinds of metals and minerals, granted to one Richard Carter in the year 1476 *Rym. Fœd.* tom. xii. Nevertheless, we have had severe laws against alchemy and multiplying of metals, as much so as against coining itself.

ALCIAT (Andrew), a great lawyer, who flourished in the 16th century, born at Milan. He mixed much of polite learning in the explication of the laws, and happily drove out the barbarity of language which till then had reigned in the lectures and writings of lawyers; for which Thuanus highly praises him. He published a great many law-books, and some notes upon Tacitus. His Emblems have been much admired, and translated into French, Italian, and Spanish; and several learned men have written commentaries on them.

ALCIBIADES, an Athenian general. It was the fate of this great man to live at a time when his country was a scene of confusion. The Greeks, grown insolent from their conquests in Persia, turned their arms against each other, and bandied together under the conduct of the two most opulent states Athens and Lacedæmon. Alcibiades, in the midst of an expedition he had planned against the enemy of his country, was recalled home to answer some charge of a private nature; but fearing the violence of his enemy, instead of going to Athens, he offered his services at Sparta, where they were readily accepted. By his advice the Lacedæmonians made a league with Persia, which gave a very favourable turn to their affairs. But his credit in the republic raising jealousies against him, he privately reconciled himself to his country, and took again the command of an Athenian army. Here victory waiting as it were at his command, attended all his motions. The loss of seven battles obliged the Spartans to sue for peace. He enjoyed his triumphs, however, only a short time at Athens. One unsuccessful event made him again obnoxious to the malice of his citizens; and he found it expedient to retire from Athens. In his absence the Spartans again took the lead, and at the fatal battle of Ægos entirely subdued the Athenian power. Alcibiades, though an exile, endeavoured to restore the power of his country; of which the Spartans having intelligence, procured him to be assassinated. He was a man of admirable accomplishments, but indifferently principled: of great parts; and of an amazing versatility of genius.

ALCINOUS, king of the Phœnicians, in the island now called *Corfu*, was son of Nausithous, and grandson of Neptune and Peribea. It is by his gardens this king has chiefly immortalized his memory. He received Ulysses with much civility, when a storm had cast him on his coast. The people here loved pleasure and good cheer, yet were skilful seamen; and Alcinous was a good Prince.

ALCMAER, a city of the United Provinces, seated in North Holland, about four miles from the sea, 15 from Haerlem, and 18 from Amsterdam. It is a handsome city, and one of the cleanest in Holland. The streets and houses are extremely neat and regular, and the public buildings very beautiful. It had formerly two parish-churches, dedicated to St Matthew and St Lawrence. The latter had so high a tower, that it served for a sea-mark to the vessels that were in the open sea; but, in 1464, it tumbled down, and damaged the other church so much, that they were

both

both demolished in 1470, and one church was built in their stead, dedicated to the same saints. The Spaniards, under the command of Frederic of Toledo, son of the duke d'Alva, came to besiege it, after they had taken Haerlem in 1573; but were forced to raise the siege, after three months lying before it, as well on account of the infection of the air as the stout resistance of the inhabitants and soldiers; even the women signalizing themselves bravely in its defence. It is recorded in the register of this city, that, in the year 1637, 120 tulips, with the off-sets, sold for 90,000 florins. The town has a very good trade in butter and cheese, of which a vast quantity is sold every year, and is esteemed the best in Holland, E. Long. 4. 26. N. Lat. 52. 28.

ALCMAN, a lyric poet, who flourished in the 27th Olympiad. He was born at Sparta; and composed several poems, of which only some fragments are remaining, quoted by Athenæus and some other ancient writers. He was very amorous: accounted the father of gallant poesy; and is said to have been the first that introduced the custom of singing love-songs in company. He is reported to have been one of the greatest eaters of his age; upon which Mr Bayle remarks that such a quality would have been extremely inconvenient, if poetry had been at that time upon such a footing as it has been often since, not able to procure the poet bread. He died of a strange disease; for he was eat up with lice.

ALCMANIAN, in ancient lyric poetry, a kind of verse consisting of two dactyles and two trochees; as,—

Virginı|bus pue|risque|canto

The word is formed from *Alcman*, the name of an ancient Greek poet, in great esteem for his erotics or amorous composition.

ALCMENA, the daughter of Electryo king of Mycenæ, and wife of Amphitryon. Jupiter putting on the shape of her husband while he was abroad in the wars, begot Hercules upon her: he made that night as long as three ordinary ones.

ALCOCK (John), doctor of laws and bishop of Ely in the reign of king Henry VII. was born at Beverly in Yorkshire, and educated at Cambridge. He was first made dean of Westminster, and afterwards appointed master of the rolls. In 1471, he was consecrated bishop of Rochester. In 1476, he was translated to the see of Worchester; and in 1486, to that of Ely, in the room of Dr John Morton, preferred to the see of Canterbury. He was a prelate of great learning and piety; and so highly esteemed by king Henry, that he appointed him lord president of Wales, and afterwards lord chancellor of England. Alcock founded a school at Kingston upon Hull, and built the spacious hall belonging to the episcopal palace at Ely. He was also the founder of Jesus-college in Cambridge for a master, six fellows, and as many scholars. This house was formerly a nunnery, dedicated to St Radigund: and, as Godwin tells us, the building being greatly decayed, and the revenues reduced almost to nothing, the nuns had all forsaken it except two; whereupon bishop Alcock procured a grant from the crown, and converted it into a college. But Cambden and others tell us, that the nuns of that house were so notorious for their incontinence, that king Henry VII. and pope Julis II. consented to its dissolution: Bale accordingly calls this nunnery *spiritualium meretricum cænobium*, "a community of spiritual harlots." Bishop Alcock wrote several pieces; amongst which are the following; 1. *Mons Perfectionis*. 2. *In Psalmos Penitentiales*. 3. *Homiliæ Vulgares*. 4. *Meditationes Piæ*. He died October 1. 1500; and was buried in the chapel he had built at Kingston upon Hull.

ALCOHOL, or ALKOOL, in chemistry, spirit of wine highly rectified †. It is also used for any highly rectified spirit.—Alcohol is extremely light and inflammable: It is a strong antiseptic, and therefore employed to preserve animal substances.

† See *Chemistry* (Index), and *Pharmacy*.

ALCOHOL is also used for any fine impalpable powder.

ALCOHOLIZATION, the process of rectifying any spirit. It is also used for pulverization.

ALCOR, in astronomy, a small star adjoining to the large bright one in the middle of the tail of *ursa major*.—The word is Arabic. It is a proverb among the Arabians, applied to one who pretends to see small things, but overlooks much greater: *Thou canst see Alcor and not yet see the full moon.*

ALCORAN, or AL-KORAN, the scripture, or bible, of the Mahometans. The word is compounded of the Arabic particle *al*, and *coran* or *koran*, derived from the verb *caraa* or *karaa*, to read. The word therefore properly signifies, *the reading;* or rather, *that which ought to be read.* By this name the Mahometans denote not only the entire book or volume of the Koran, but also any particular chapter or section of it: just as the Jews call either the whole scripture, or any part of it, by the name of *Karah*, or *Mikra*, words of the same origin and import.

Besides this peculiar name, the Koran is also honoured with several appellations common to other books of scripture: as, *al Farkan*, from the verb *foraka, to divide* or *distinguish*; not, as the Mahometan doctors say, because those books are divided into chapters or sections, or distinguish between good and evil; but in the same notion that the Jews use the word *Perek*, or *Pirka*, from the same root, to denote a section or portion of scripture. It is also called *al Moshaf*, *the volume*, and *al Kitab*, *the book*, by way of eminence, which answers to the *Biblia* of the Greeks; and *al Dhikr, the admonition*, which name is also given to the Pentateuch and Gospel.

The Koran is divided into 114 larger portions of very unequal length, which we call *chapters*; but the Arabians *sowar*, in the singular *sura*; a word rarely used on any other occasion, and properly signifying a row, order, or a regular series; as a course of bricks in building, or a rank of soldiers in an army; and is the same in use and import with the Sura, or Tora, of the Jews, who also call the fifty-three sections of the Pentateuch *Sedarim*, a word of the same signification.

These chapters are not, in the manuscript copies, distinguished by their numerical order, but by particular titles, which are taken sometimes from a particular matter treated of, or person mentioned therein; but usually from the first word of note, exactly in the same manner as the Jews have named their Sedarim; though the word from which some chapters are denominated be very far distant, towards the middle, or perhaps the end, of the chapter: which seems ridiculous. But the occasion of this appears to have been, that the verse of

passage

passage wherein such word occurs, was, in point of time, revealed and committed to writing before the other verses of the same chapter which precede it in order; and the title being given to the chapter before it was completed, or the passages reduced to their present order, the verse from whence such title was taken did not always happen to begin the chapter. Some chapters have two or more titles, occasioned by the difference of the copies.

Some of the chapters having been revealed at Mecca, and others at Medina, the noting this difference makes a part of the title: but the reader will observe, that several of the chapters are said to have been revealed partly at Mecca and partly at Medina; and, as to others, it is yet a dispute among the commentators to which of the two places they belong.

Every chapter is subdivided into smaller portions, of very unequal length also, which we customarily call *verses*: but the Arabic word is *ayat*, the same with the Hebrew *ototh*, and signifies *signs* or *wonders*: such as are the secrets of God, his attributes, works, judgements, and ordinances, delivered in those verses; many of which have their particular titles also, imposed in the same manner as those of the chapters.

Besides these unequal divisions of chapter and verse, the Mahometans have also divided their Koran into sixty equal portions, which they call *Ahzab*, in the singular *Hizb*, each subdivided into four equal parts; which is also an imitation of the Jews, who have an ancient division of their Mishna into sixty portions called *Massictoth*. But the Koran is more usually divided into thirty sections only, named *Ajza*, from the singular *Joz*, each of twice the length of the former, and in the like manner subdivided into four parts. These divisions are for the use of the readers of the Koran in the royal temples, or in the adjoining chapels where the emperors and great men are interred. There are thirty of these readers belonging to every chapel, and each reads his section every day; so that the whole Koran is read over once a-day.

Next after the title, at the head of every chapter, except only the ninth, is prefixed the following solemn form, by the Mahometans called the *Bismallah*, In the name of the most merciful God; which form they constantly place at the beginning of all their books and writings in general, as a peculiar mark or distinguishing characteristic of their religion, it being counted a sort of impiety to omit it. The Jews, for the same purpose, make use of the form, *In the name of the* Lord, or, *In the name of the great* God; and the eastern Christians that of, *In the name of the Father, and of the Son, and of the Holy Ghost*. But Mahomet probably took this form, as he did many other things, from the Persian Magi, who used to begin their books in these words, *Benam Yezdan bakshaishgher dadar*; that is, *In the name of the most merciful just* God.

There are twenty-nine chapters of the Koran, which have this peculiarity, that they begin with certain letters of the alphabet, some with a single one, others with more. These letters the Mahometans believe to be the peculiar marks of the Koran, and to conceal several profound mysteries; the certain understanding of which, the more intelligent confess, has not been communicated to any mortal, their prophet only excepted. Notwithstanding which, some will take the liberty of guessing at their meaning by that species of Cabala called by the Jews *Notarikon*, and suppose the letters to stand for as many words, expressing the names and attributes of God, his works, ordinances, and decrees; and therefore these mysterious letters, as well as the verses themselves, seem in the Koran to be called *signs*. Others explain the intent of these letters from their nature or origin, or else from their value in numbers, according to another species of the Jewish Cabala called *Gematria*: the uncertainty of which conjectures sufficiently appears from their disagreement. Thus, for example, five chapters, one of which is the second, begins with these letters A. L. M. which some imagine to stand for *Allah latiff magid*, "God *is gracious and to be glorified*;" or, *Ana li minni*, i. e. *to me and from me*, viz. belongs all perfection, and proceeds all good; or else for *Ana Allah alam*, "*I am the most wise* God," taking the first letter to mark the beginning of the first word, the second the middle of the second word, and the third the last of the third word; or for *Allah, Gabriel, Mohammed*, the author, revealer, and preacher of the Koran. Others say, that as the letter A belongs to the lower part of the throat, the first of the organs of speech; L to the palate, the middle organ; and M to the lips, which are the last organ; so these letters signify that God is the beginning, middle, and end, or ought to be praised in the beginning, middle, and end, of all our words and actions: or, as the total value of those three letters, in numbers, is seventy-one, they signify, that, in the space of so many years, the religion preached in the Koran should be fully established. The conjecture of a learned Christian is at least as certain as any of the former, who supposes those letters were set there by the amanuensis, for *Amar li Mohammed*, i. e. *at the command of Mohammed*, as the five letters prefixed to the nineteenth chapter seem to be there written by a Jewish scribe, for *Coh yaas*, i. e. *Thus he commanded*.

The Koran is universally allowed to be written with the utmost elegance and purity of language, in the dialect of the tribe of Koreish, the most noble and polite of all the Arabians, but with some mixture, tho' very rarely, of other dialects. It is confessedly the standard of the Arabic tongue, and, as the more orthodox believe, and are taught by the book itself, inimitable by any human pen (though some sectaries have been of another opinion), and therefore insisted on as a permanent miracle, greater than that of raising the dead, and alone sufficient to convince the world of its divine original.

And to this miracle did Mahomet himself chiefly appeal for the confirmation of his mission, publicly challenging the most eloquent men in Arabia, which was at that time stocked with thousands whose sole study and ambition it was to excel in elegance of style and composition, to produce even a single chapter that might be compared with it (A).

(A) As the composition and arrangement of words, however, admit of infinite varieties, it can never be absolutely said that any one is the best possible. In fact, Hamzah Benahmad wrote a book against the Alcoran with at least equal elegance; and Moselema another, which even surpassed it, and occasioned a defection of a great part of the Mussulmans. *Journ. de Sçav.* tom. xiii. p. 280. *Ouvr. de Sçav.* Nov. 1708, p. 404.

To the pomp and harmony of expression some ascribe all the force and effect of the Alcoran; which they consider as a sort of music, equally fitted with other species of that art to ravish and amaze. In this Mahomet succeeded so well, and so strangely captivated the minds of his audience, that several of his opponents thought it the effect of witchcraft and enchantment, as he himself complains. Others have attributed the effect of the Alcoran to the frequent mention of rewards and punishments; heaven and hell occurring almost in every page. Some suppose, that the sensual pleasures of paradise, so frequently set before the imaginations of the readers of the Alcoran, were what chiefly bewitched them. Tho' with regard to these, there is a great dispute whether they are to be understood literally or spiritually. Several have even allegorized the whole book.

The general design of the Koran was to unite the professors of the three different religions, then followed in the populous country of Arabia (who for the most part lived promiscuously, and wandered without guides, the far greater number being idolators, and the rest Jews and Christians mostly of erroneous and heterodox belief), in the knowledge and worship of one God, under the sanction of certain laws, and the outward signs of ceremonies partly of ancient and partly of novel institution, enforced by the consideration of rewards and punishments both temporal and eternal; and to bring them all to the obedience of Mahomet, as the prophet and ambassador of God, who, after the repeated admonitions, promises, and threats, of former ages, was at last to establish and propagate God's religion on earth, and to be acknowledged chief pontiff in spiritual matters, as well as supreme prince in temporal.

The great doctrine then of the Koran, is the unity of God; to restore which point Mahomet pretended was the chief end of his mission; it being laid down by him as a fundamental truth, That there never was, nor ever can be, more than one true orthodox religion. For, though the particular laws or ceremonies are only temporary, and subject to alteration, according to the divine direction; yet the substance of it being eternal truth, is not liable to change, but continues immutably the same. And he taught, that, whenever this religion became neglected, or corrupted in essentials, God had the goodness to re-inform and re-admonish mankind thereof, by several prophets, of whom Moses and Jesus were the most distinguished, till the appearance of Mahomet, who is their seal, and no other to be expected after him. The more effectually to engage people to hearken to him, great part of the Koran is employed in relating examples of dreadful punishments formerly inflicted by God on those who rejected and abused his messengers; several of which stories, or some circumstances of them, are taken from the Old and New Testaments, but many more from the apocryphal books and traditions of the Jews and Christians of those ages, set up in the Koran as truths in opposition to the scriptures, which the Jews and Christians are charged with having altered: and indeed, few or none of the relations or circumstances in the Koran were invented by Mahomet, as is generally supposed, it being easy to trace the greatest part of them much higher, as the rest might be, were more of those books extant, and was it worth while to make the inquiry.

The rest of the Alcoran is taken up in prescribing necessary laws and directions, frequent admonitions to moral and divine virtues, the worship and reverence of the Supreme Being, and resignation to his will. One of their most learned commentators distinguishes the contents of the Alcoran into *allegorical* and *literal*; under the former are comprehended all the obscure, parabolical, and enigmatical passages, with such as are repealed, or abrogated; the latter, such as are clear, and in full force.

The most excellent moral in the whole Alcoran, interpreters say, is that in the chapter *Al Alraf*, viz. Shew mercy, do good to all, and dispute not with the ignorant; or, as Mr Sale renders it, Use indulgence, command that which is just, and withdraw far from the ignorant. Mahomet, according to the authors of the *Keschaf*, having begged of the angel Gabriel a more ample explication of this passage, received it in the following terms: "Seek him who turns thee out, give to "him who takes from thee, pardon him who injures "thee; for God will have you plant in your souls the "roots of his chief perfections." It is easy to see that this commentary is copied from the gospel.—In reality, the necessity of forgiving enemies, though frequently inculcated in the Alcoran, is of a later date among the Mahometans than among the Christians: among those latter, than among the heathens; and to be traced originally among the Jews. (See Exodus xxxiii. 4, 5.) But it matters not so much who had it first, as who observes it best. The Caliph Hassan, son of Hali, being at table, a slave unfortunately let fall a dish of meat reeking hot, which scalded him severely. The slave fell on his knees, rehearsing these words of the Alcoran, "Paradise is for those who restrain their "anger." I am not angry with thee, answered the caliph.—"And for those who forgive offences against them," continues the slave. I forgive thee thine, replies the caliph—"But above all, for those who return good for evil," adds the slave. I set thee at liberty, rejoined the caliph; and I give thee ten dinars.

There are also a great number of occasional passages in the Alcoran, relating only to particular emergencies. For this advantage Mahomet had in the piecemeal method of receiving his revelation, that whenever he happened to be perplexed and gravelled with any thing, he had a certain resource in some new morsel of revelation. It was an admirable contrivance of his, to bring down the whole Alcoran at once, only to the lowest heaven, not to earth; since, had the whole been published at once, innumerable objections would have been made, which it would have been impossible for him to solve: but as he received it by parcels, as God saw fit they should be published for the conversion and instruction of the people, he had a sure way to answer all emergencies, and to extricate himself with honour from any difficulty which might occur.

It is the general and orthodox belief among the Mahometans, that the Koran is of divine original: that it is eternal and uncreated, remaining, as some express it, in the very essence of God: that the first transcript has been from everlasting by God's throne, written on a table of vast bigness, called the *preserved table*, in which are also recorded the divine decrees past and future: that a copy from this table, in one volume on paper, was by the ministry of the angel Gabriel sent down to the lowest heaven, in the month of Ramadan, on the night

of

Alcoran.

of *power*; from whence Gabriel revealed it to Mahomet by parcels, some at Mecca, and some at Medina, at different times, during the space of 23 years, as the exigency of affairs required; giving him, however, the consolation to show him the whole (which they tell us was bound in silk, and adorned with gold and precious stones of paradise) once a-year; but in the last year of his life he had the favour to see it twice. They say, that few chapters were delivered entire, the most part being revealed piecemeal, and written down from time to time by the prophet's amanuensis in such a part of such and such a chapter, till they were completed, according to the directions of the angel. The first parcel that was revealed is generally agreed to have been the first five verses of the 96th chapter.

After the new-revealed passages had been from the prophet's mouth taken down in writing by his scribe, they were published to his followers; several of whom took copies for their private use, but the far greater number got them by heart. The originals, when returned, were put promiscuously into a chest, observing no order of time; for which reason it is uncertain when many passages were revealed.

When Mahomet died, he left his revelations in the same disorder, and not digested into the method, such as it is, in which we now find them. This was the work of his successor Abu Becr; who, considering that a great number of passages were committed to the memory of Mahomet's followers, many of whom were slain in their wars, ordered the whole to be collected, not only from the palm-leaves and skins on which they had been written, and which were kept between two boards or covers, but also from the mouths of such as had gotten them by heart. And this transcript, when completed, he committed to the custody of Haffa the daughter of Omar, one of the prophet's widows.

From this relation it is generally imagined that Abu Becr was really the compiler of the Koran; though, for aught appears to the contrary, Mahomet left the chapters complete as we now have them, excepting such passages as his successor might add or correct from those who had gotten them by heart; what Abu Becr did else, being perhaps no more than to range the chapters in their present order, which he seems to have done without any regard to time, having generally placed the longest first.

However, in the 30th year of the Hegira, Othman being then caliph, and observing the great disagreement in the copies of the Koran in the several provinces of the empire; those of Irak, for example, following the reading of Abu Musa al Ashari, and the Syrians that of Macdad Ebn Aswad; he, by the advice of the *companions*, ordered a great number of copies to be transcribed from that of Abu Becr, in Haffa's care, under the inspection of Zeid Ebn Thabet, Abd'allah Ebn Zobair, Said Ebn al As, and Ad'alrahman Ebn al Hareth the Makhzumite; whom he directed, that, wherever they disagreed about any word, they should write it in the dialect of the Koreish, in which it was at first delivered. These copies, when made, were dispersed in the several provinces of the empire, and the old ones burnt and suppressed. Though many things in Haffa's copy were corrected by the abovementioned revisers, yet some few various readings still occur.

In fine, the book of the Alcoran is held in the highest esteem and reverence among the Musselmans. They dare not so much as touch the Alcoran without being first washed, or legally purified; to prevent which, an inscription is put on the cover or label, *Let none touch but they who are clean*. It is read with great care and respect; being never held below the girdle. They swear by it; take omens from it on all weighty occasions; carry it with them to war; write sentences of it in their banners; adorn it with gold and precious stones; and knowingly suffer it not to be in the possession of any of a different religion. Some say that it is punishable even with death, in a Christian, to touch it; others, that the veneration of the Mussulmans leads them to condemn the translating it into any other language as a profanation: but these seem to be aggravations. The Mahometans have taken care to have their scripture translated into the Persian, the Javan, the Malayan, and other languages; tho' out of respect to the original, these versions are generally, if not always, interlineated.

View of Christianity and Mahometanism, p. 257.

By the advocates of Mahometanism, the Koran, as already observed, has always been held forth as the greatest of miracles, and equally stupendous with the act of raising the dead. The miracles of Moses and Jesus, they say were transient and temporary; but that of the Koran is permanent and perpetual; and therefore far surpasses all the miraculous events of preceding ages. We will not detract from the real merit of the Koran: we allow it to be generally elegant, and often sublime: but at the same time we reject with disdain its arrogant pretence to any thing supernatural; all the real excellence of the work being easily referable to natural and visible causes.

In the language of Arabia, a language extremely loved and diligently cultivated by the people to whom it was vernacular, Mahomet found advantages which were never enjoyed by any former or succeeding impostor. It requires not the eye of a philosopher to discover in every soil and country a principle of national pride: and if we look back for many ages to the history of the Arabians, we shall easily perceive that pride among them invariably to have consisted in the knowledge and improvement of their native language. The Arabic, which has been justly esteemed the most copious of the eastern tongues; which had existed from the remotest antiquity; which had been established by numberless poets, and refined by the constant exercise of the natives: was the most successful instrument which Mahomet employed in planting his new religion among them. Admirably adapted by its unrivalled harmony, and by its endless variety to add painting to expression, and to pursue the imagination in its unbounded flight; it became in the hands of Mahomet an irresistible charm to blind the judgment, and to captivate the fancy of his followers.

"Of that description of men who first composed the adherents of Mahomet, and to whom the Koran was addressed, few, probably, were able to pass a very accurate judgment on the propriety of the sentiments, or on the beauties of the diction: but all could judge of the military abilities of their leader; and in the midst of their admiration it is not difficult to conceive, that they would ascribe to his compositions every imaginary beauty of inspired language.

"The shepherd and the soldier, though awake to the charms

charms of thoſe wild but beautiful compoſitions, in which were celebrated their favourite occupations of love or war, were yet little able to criticiſe any other works than thoſe which were addreſſed to their imagination or the heart. To abſtract reaſonings on the attributes and the diſpenſations of the Deity, to the comparative excellencies of rival religions, to the conſiſtency of any one religious ſyſtem in all its parts, and to the force of its various proofs, they were quite inattentive. In ſuch a ſituation, the appearance of a work which poſſeſſed ſomething like wiſdom and conſiſtence; which preſcribed the rules, and illuſtrated the duties of life; and which contained the principles of a new and comparatively-ſublime theology, independently of its real and permanent merit, was likely to excite their aſtoniſhment, and to become the ſtandard of future compoſition.

"In the firſt periods of the literature of every country, ſomething of this kind has happened. The father of Grecian poetry very obviouſly influenced the taſte and imitation of his countrymen. The modern nations of Europe all poſſeſs ſome original author, who, riſing from the darkneſs of former ages, has begun the career of compoſition, and tinctured with the character of his own imagination the ſtream which has flowed through his poſterity.

"But the prophet of Arabia had in this reſpect advantages peculiar to himſelf. His compoſitions were not to his followers the works of man, but the genuine language of Heaven, which had ſent him. They were not confined therefore to that admiration which is ſo liberally beſtowed on the earlieſt productions of genius, or to that fond attachment with which men every where regard the original compoſitions of their country: but with their admiration they blended their piety. To know and to feel the beauties of the Koran, was in ſome reſpect to ſhare in the temper of Heaven; and he who was moſt affected with admiration in the peruſal of its beauties, ſeemed moſt fitly the object of that mercy which had given it to ignorant man. The Koran, therefore, became naurally and neceſſarily the ſtandard of taſte. With a language thus hallowed in their imaginations, they were too well ſatisfied, either to diſpute its elegance or improve its ſtructure. In ſucceeding ages, the additional ſanction of antiquity, or preſcription, was given to theſe compoſitions which their fathers had admired: and while the belief of its divine original continues, that admiration, which has thus become the teſt and the duty of the faithful, can neither be altered nor diminiſhed.

"When therefore we conſider theſe peculiar advantages of the Koran, we have no reaſon to be ſurpriſed at the admiration in which it is held. But if, deſcending to a more minute inveſtigation of it, we conſider its perpetual inconſiſtence and abſurdity, we ſhall indeed have cauſe for aſtoniſhment at that weakneſs of humanity which could ever have received ſuch compoſitions as the work of the Deity.

"The firſt praiſe of all the productions of genius, is invention; that quality of the mind, which, by the extent and quickneſs of its views, is capable of the largeſt conceptions, and of forming new combinations of objects the moſt diſtant and unuſual. But the Koran bears little impreſſion of this tranſcendant character. Its materials are wholly borrowed from the Jewiſh and Chriſtian ſcriptures, from the Talmudical legends and apocryphal goſpels then current in the Eaſt, and from the traditions and fables which abounded in Arabia. The materials collected from theſe ſeveral ſources are here heaped together, with perpetual and needleſs repetitions, without any ſettled principle or viſible connection.

"When a great part of the life of Mahomet had been ſpent in preparatory meditation on the ſyſtem he was about to eſtabliſh, its chapters were dealt out ſlowly and ſeparately during the long period of 23 years. Yet thus defective in its ſtructure, and not leſs exceptionable in its doctrines, was the work which Mahomet delivered to his followers as the oracles of God.

"The moſt prominent feature of the Koran, that point of excellence in which the partiality of its admirers has ever delighted to view it, is the ſublime notion it generally impreſſes of the nature and attributes of God. If its author had really derived theſe juſt conceptions from the inſpiration of that Being whom they attempt to deſcribe, they would not have been ſurrounded, as they now are on every ſide, with error and abſurdity. But it might eaſily be proved, that whatever it juſtly defines of the divine attributes, was borrowed from our holy ſcripture; which even from its firſt promulgation, but eſpecially from the completion of the New Teſtament, has extended the views and enlightened the underſtandings of mankind; and thus furniſhed them with arms, which have too often been ineffectually turned againſt itſelf by its ungenerous enemies.

"In this inſtance particularly, the copy is far below the great original, both in the propriety of its images, and the force of its deſcriptions. Our holy ſcriptures are the only compoſitions that can enable the dim ſight of mortality to penetrate into the inviſible world, and to behold a glimpſe of the Divine perfections. Accordingly, when they would repreſent to us the happineſs of Heaven, they deſcribe it, not by any thing minute and particular, but by ſomething general and great; ſomewhat, that without deſcending to any determinate object, may at once by its beauty and immenſity excite our wiſhes and elevate our affections. Though in the prophetical and evangelical writings the joys that ſhall attend us in a future ſtate are often mentioned with ardent admiration, they are expreſſed rather by alluſion than ſimilitude, rather by indefinite and figurative terms, than by any thing fixed and determinate. 'Eye hath not ſeen, nor ear heard, neither have entered into the heart of man, the things which God hath prepared for them that love him.' 1 *Cor.* ii. 9. What a reverence and aſtoniſhment does this paſſage excite in every hearer of taſte and piety? What energy, and at the ſame time what ſimplicity, in the expreſſion? How ſublime, and at the ſame time how obſcure, is the imagery.

"Different was the conduct of Mahomet in his deſcriptions of heaven and of paradiſe. Unaſſiſted by the neceſſary influence of virtuous intentions and Divine inſpiration, he was neither deſirous, nor indeed able, to exalt the minds of men to ſublime conceptions, or to rational expectations. By attempting to explain what is inconceivable, to deſcribe what is eneffable, and to materialize what in itſelf is ſpiritual; he abſurdly and impiouſly aimed to ſenſualize the purity of the Divine eſſence. Thus he fabricated a ſyſtem of incoherence, a religion of depravity, totally repugnant indeed to the nature of that Being, who, as he pretended, was its object; but therefore more likely to accord with the appetites and conceptions of a corrupt and ſenſual age.

"That we may not appear to exalt our Scriptures thus far above the Koran by an unreaſonable preference we ſhall produce a part of the ſecond chapter of the latter, which is deſervedly admired by the Mahometans, who wear it engraved on their ornaments, and recite it in their prayers. 'God! there is no God but he; the living, the ſelf-ſubſiſting: neither ſlumber nor ſleep ſeizeth him: to him belongeth whatſoever is in heaven, and on earth. Who is he that can intercede with him but through his good pleaſure? He knoweth that which is paſt, and that which is to come. His throne is extended over heaven and earth, and the preſervation of both is to him no burden. He is the high, the mighty.' *Sale's Kor.* ii. p. 30. 4to edit.

"To this deſcription who can refuſe the praiſe of magnificence? Part of that magnificence, however, is to be referred to that verſe of the Pſalmiſt, whence it was borrowed, 'He that keepeth Iſrael, ſhall neither ſlumber nor ſleep.' *Pſal.* cxxi. 4.

"But if we compare it with that other paſſage of the ſame inſpired Pſalmiſt, all its boaſted grandeur is at once obſcured, and loſt in the blaze of a greater light.

"O my God, take me not away in the midſt of my days; thy years are throughout all generations. Of old haſt thou laid the foundations of the earth; and the heavens are the work of thy hands. They ſhall periſh, but thou ſhalt endure: yea all of them ſhall wax old, as doth a garment; as a veſture ſhalt thou change them, and they ſhall be changed; but thou art the ſame, and thy years ſhall not fail.'

"The Koran, therefore, upon a retroſpective view of theſe ſeveral circumſtances, far from ſupporting its arrogant claim to a ſupernatural work, ſinks below the level of many compoſitions confeſſedly of human original; and ſtill lower does it fall in our eſtimation, when compared with that pure and perfect pattern which we juſtly admire in the ſcriptures of truth.

"It is therefore abundantly apparent, that no miracle either was externally performed for the ſupport, or is internally involved in the compoſition, of the Mahometan revelation."

ALCORAN, is alſo figuratively applied to certain other books full of impieties and impoſtures.—In this ſenſe we meet with the *Alcoran* of the Cordeliers, which has made a great noiſe; wherein St Francis is extravagantly magnified, and put on a level with Jeſus Chriſt. The Alcoran of the Cordeliers is properly an extract of a very ſcarce book, intitled, The conformity of the life of the ſeraphic father St Francis with the life of Chriſt, publiſhed in 1500, 4to; ſince, at Bologna, in folio. Eraſmus Albertus, being by the elector of Brandenburg appointed to viſit a monaſtery of Franciſcans, found this book; and being ſtruck with the extreme folly and abſurdity of it, collected a number of curioſities out of it, and publiſhed them under the title of the *Alcoran* of the Franciſcans, with a preface by Martin Luther.

ALCORANISTS, among Mahometans, thoſe who adhere ſtrictly to the letter or text of the alcoran, from an opinion of its ultimate ſufficiency and perfection. The Perſians are generally *Alcoraniſts*, as admitting the Alcoran alone for their rule of faith. The Turks, Tartars, Arabs, &c. beſides the Alcoran, admit a multitude of traditions. The Alcoraniſts, among Mahometans, amount to much the ſame with the textuaries among the Jews. The Alcoraniſts can find nothing excellent out of the Alcoran; are enemies of philoſophers, metaphyſicians, and ſcholaſtic writers. With them the Alcoran is every thing.

ALCOVE, among builders, a receſs, or part of a chamber ſeparated by an eſtrade, or partition of columns, and other correſponding ornaments, in which is placed a bed of ſtate, and ſometimes ſeats to entertain company. Theſe alcoves are frequent in Spain; and the bed is raiſed two or three aſcents, with a rail at the foot.

ALCUINUS (Flaccus), an eccleſiaſtic of the eighth century. Where he was born, is a matter of diſpute; but, according to the moſt probable opinion, it was in Yorkſhire. It is pretty certain, however, that he was educated at York, under the direction of archbiſhop Egbert, as we learn from his own letters, in which he frequently calls that great prelate his beloved maſter, and the clergy of York the companions of his youthful ſtudies. As he ſurvived venerable Bede about 70 years, it is hardly poſſible that he could have received any part of his education under him, as ſome writers of literary hiſtory have affirmed; and it is worthy of obſervation, that he never calls that great man his maſter, though he ſpeaks of him with the higheſt veneration. It is not well known to what preferments he had attained in the church before he left England, though ſome ſay he was abbot of Canterbury. The occaſion of his leaving his native country, was his being ſent on an embaſſy by Offa king of Mercia to the emperor Charlemagne; who contracted ſo great an eſteem and friendſhip for him, that he earneſtly ſolicited, and at length prevailed upon him, to ſettle in his court, and became his preceptor in the ſciences. Alcuinus accordingly inſtructed that great prince in rhetoric, logic, mathematics, and divinity; which rendered him one of his greateſt favourites. "He was treated with ſo much kindneſs and familiarity (ſays a cotemporary writer) by the Emperor, that the other courtiers called him, by way of eminence, *the emperor's delight*." Charlemagne employed his learned favourite to write ſeveral books againſt the heretical opinions of Felix Biſhop of Urgel in Catalonia, and to defend the orthodox faith againſt the hereſiarch, in the council of Francfort, A. D. 894; which he performed to the entire ſatisfaction of the Emperor and council, and even to the conviction of Felix and his followers, who abandoned their errors. The Emperor conſulted chiefly with Alcuinus on all things relating to religion and learning; and, by his advice, did many great things for the advancement of both. An academy was eſtabliſhed in the imperial palace, over which Alcuinus preſided, and in which the princes and prime nobility were educated; and other academies were eſtabliſhed in the chief towns of Italy and France, at his inſtigation, and under his inſpection. "France (ſays one of our beſt writers of literary hiſtory) is indebted to Alcuinus for all the polite learning it boaſted of in that and the following ages. The univerſities of Paris, Tours, Fulden, Soiſſons, and many others, owe to them their origin and increase; those of whom he was not the superior and founder, being at least enlightened by his doctrine and example, and enriched by the benefits he procured for them from Charlemagne." After Alcuinus had spent many years in the most intimate familiarity with the greatest prince of his age, he at length, with great difficulty, obtained leave to retire from court to his abbey of St Martin's at Tours. Here he kept up a constant correspondence by letters with Charlemagne; from which it appears that both the emperor and his learned friend were animated with the most ardent love to learning and religion, and constantly employed in contriving and executing the noblest designs for their advancement. He composed many treatises on a great variety of subjects, in a style much superior in purity and elegance to that of the generality of writers in the age in which he flourished. Charlemagne often solicited him, with all the warmth of a most affectionate friend, to return to court, and favour him with his company and advice; but he still excused himself; and nothing could draw him from his retirement in his abbey of St Martin in Tours, where he died A. D. 904. His works were collected and published by Andrew du Chesne in one volume folio, Paris, 1617. They consist of, 1. Tracts upon scripture. 2. Tracts upon doctrine, discipline, and morality. 3. Historical treatises, letters, and poems. Since that edition, there has been published an incredible number of tracts, poems, &c. ascribed to this author, most of which, in all probability, were not his.

ALCYON, the trivial name of a species of alcedo. See ALCEDO.

ALCYONIUM, an obsolete name of a submarine plant. It is also used for a kind of coral, or astroites, frequently found fossile in England.

ALCYONIUM *Stagnum* (anc. geog.), a lake in the territory of Corinth, whose depth was unfathomable, and in vain attempted to be discovered by Nero. Thro' this lake Bacchus is said to have descended to hell, to bring back Semele; (Pausanias).

ALCYONIUS (Peter), a learned Italian, who flourished in the 16th century. He was well versed in the Greek and Latin tongues, and wrote some pieces of eloquence which met with great approbation. He was corrector of the press a considerable time for Aldus Manutius, and is entitled to a share in the praises given to the editions of that learned printer. He published a treatise concerning banishment, which contained so many fine passages intermixed with others quite the reverse, that it was thought he had tacked to somewhat of his own, several fragments of a treatise of *Cicero de gloria*; and that afterwards, in order to save himself from being detected in this theft, he burnt the manuscript of Cicero, the only one extant. Paulus Manutius, in his commentary upon these words of Cicero, *Librum tibi celeriter mittam de gloria*, "I will speedily send you my treatise on glory;" has the following passage relating to this affair: "He means, (says he) his two books on Glory, which were handed down to the age of our fathers; for Bernard Justinian, in the index of his books, mentions *Cicero de Gloria*. This treatise, however, when Bernard had left his whole library to a nunnery, could not be found, though sought after with great care: nobody doubted but Peter Alcyonius, who, being physician to the nunnery, was entrusted with the library, had basely stole it. And truly, in his treatise Of Banishment, some things are found interspersed here and there, which seem not to favour of Alcyonius, but of some higher author." The two orations he made after the taking of Rome, wherein he represented very strongly the injustice of Charles V. and the barbarity of his soldiers, were excellent pieces. There is also an oration ascribed to him on the knights who died at the siege of Rhodes.

ALDBOROUGH, a sea-port town in Suffolk, with a market on Saturdays. It is pleasantly situated, in a dale, between a high hill to the westward, on which its large old-built church stands; the sea to the east, and its river running south-west. It is a large, long, ordinary town, made up of two or three streets of low houses, running parallel to each other. A quarter of a mile to the south lies Slaughden, where they have a commodious key, with warehouses for fish: more southerly still, they have conveniences for drying their north-sea fish. Their employment in the fishery is their chief business, which is considerable in the seasons for catching herrings and sprats; and it is the only place in England for curing red sprats. It is a town corporate, and sends two members to parliament. Towards the sea, it has some pieces of cannon planted for its defence. It is 88 miles north-east from London. E. Long. 1. 32. N. Lat. 52. 50.

ALDBOROUGH, a market-town in the west riding of Yorkshire, seated on the river Ouse, 15 miles north-west of York, and 200 miles north of London. It sends two members to parliament. W. Long. 0. 20. N. Lat. 54. 15. It was anciently a Roman city, called *Isurium Brigantium*; and several coins and monuments of the Saxons and Romans have been discovered there.

ALDEBARAN, in astronomy, a star of the first magnitude, called in English the *bull's eye*, as making the eye of the constellation Taurus. Its longitude is 6 deg. 32 min. 9 sec. of Gemini, and its latitude 5 deg. 29 min. 40 sec. south.

ALDER-TREE, in Botany. See BETULA.

ALDERHOLM, a pleasant island of Sweden, formed by the three arms of a river running thro' Gentle, a town of Nordland, in Sweden. Here is a wharf, a repository for planks and deals, two packing houses, a large customhouse for taking toll of the ships, an arsenal for cannon, and a granary.

ALDERMAN, in the British policy, a magistrate subordinate to the lord-mayor of a city or town-corporate. The number of these magistrates is not limited, but is more or less according to the magnitude of the place. In London they are 26; each having one of the wards of the city committed to his care. This office is for life; so that when one of them dies, or resigns, a ward-mote is called, who return two persons, one of whom the lord-mayor and aldermen choose to supply the vacancy. All the aldermen are justices of the peace, by a charter of 15 Geo. II. The aldermen of London, &c. are exempted from serving inferior offices; nor shall they be put upon assizes, or serve on juries, so long as they continue to be aldermen.

ALDERMAN, among the ancient Saxons, was a degree of nobility answering to earl or count at present.

ALDERMAN was also used, in the time of king Edgar, for a judge or justice. Thus we meet with the

the titles of *Aldermannus totius Angliæ*, *aldermannus regis*, *comitatus*, *civitatis*, *burgi*, *castelli*, *hundredi sive wapentachii*, *et novemdecimorum*. According to Spelman, the *aldermannus totius Angliæ* seems to have been the same officer who was afterwards styled *capitalis justitiarius Angliæ*, or chief-justice of England; the *aldermannus regis* seems to have been an occasional magistrate, answering to our justice of assize; and the *alddermannus comitatus*, a magistrate who held a middle rank between what was afterward called *earl* and the *sheriff*; he sat at the trial of causes with the bishop: the latter proceeding according to ecclesiastical law, and the former declaring and expounding the common law of the land.

ALDERNEY, an island in the British channel, subject to the crown of Great Britain. It is about eight miles in compass, and is separated from Cape la Hogue, in Normandy, by a narrow streight, called the *Race of Alderney*, which is a very dangerous passage in stormy weather when the two currents meet; otherwise it is safe, and has depth of water for the largest ships. Thro' this streight the French fleet made their escape after their defeat at La Hogue, in 1692. It is a healthy island, has but one church, is fruitful both in corn and pasture, and is remarkable for a fine breed of cows. The inhabitants, for their greater safety, live together in a town of the same name. The number of houses are said to be 200, and the inhabitants 1000. It has but one harbour, called *Crabby*, which is at a good distance from the town; and is only fit for small vessels. To the west lie the range of rocks called the *Caskets*, so dangerous to mariners. W. Long. 2. 17. N. Lat. 49. 50.

ALDHELM (St), bishop of Shereburn in the time of the Saxon Heptarchy. He is said to have been the son of Kenred, brother to Ina, king of the West-Saxons; but, in the opinion of William of Malmsbury, his father was no more than a distant relation to the king. Having received the first part of his education in the school which one Macdulf, a learned Scot, had set up in the place where Malmsbury now stands, he travelled into France and Italy for his improvement. At his return home, he studied some time under Adrian abbot of St Augustine's in Canterbury, the most learned professor of the sciences who had ever been in England. In these different seminaries he acquired a very uncommon stock of knowledge; and became famous for his learning, not only in England, but in foreign countries: whence several learned men sent him their writings for his perusal and correction; particularly Prince Arcivil, a son of the king of Scotland, who wrote many pieces which he sent to Aldhelm, "intreating him to give them the last polish, by rubbing off their Scots rust." He was the first Englishman who wrote in the Latin language both in prose and verse, and composed a book for the instruction of his countrymen in the prosody of that language. Besides this, he wrote several other treatises on various subjects; some of which are lo t, and others published by Martin Delrio and Canisius. Venerable Bede, who flourished in the end of this and the begining of the next century, gives the following character of Aldhelm: "He was a man of universal erudition, having an elegant style, and being wonderfully well acquainted with books, both on philosophical and religious subjects." In fact, considering the cloud of ignorance by which he was surrounded, and the great difficulty of acquiring knowledge without proper instruction, Aldhelm was a very extraordinary man. From one of his letters to Hedda bishop of Winchester, concerning the nature of his studies whilst at Canterbury, he appears to have been indefatigably determined to acquire every species of learning in his power. For a copy of this curious epistle, see Henry's History, vol. ii. p. 320. King Alfred the Great declared, that Aldhelm was the best of all the Saxon poets; and that a favourite song, which was universally sung in his time, near 200 years after its author's death, was of his composition. When he was abbot of Malmsbury, having a fine voice, and great skill in music as well as poetry, and observing the backwardness of his barbarous countrymen to listen to grave instructions, he composed a number of little poems, which he sung to them after mass in the sweetest manner; by which they were gradually instructed and civilized. After this excellent person had governed the monastery of Malmsbury, of which he was the founder, about 30 years, he was made bishop of Shereburn, where he died A. D. 709.—He wrote, 1. *De octo vitiis principalibus*. This treatise is extant in *Bibliotheca Patrum* of Canisius. 2. *Ænigmaticum versus mille*. This, with several other of his poems, was published by Martin Delrio at Mentz, 8vo, 1601. 3. A book addressed to a certain king of Northumberland, named Alfrid, on various subjects. 4. *De vita monachorum*. 5. *De laude sanctorum*. 6. *De arithmetica*. 7. *De astrologia*. 8. A book against the mistake of the Britons concerning the celebration of Easter; printed by Sonius, 1576. 9. *De laude virginitatis*. Manuscript, in Bennet-college, Cambridge. Published among Bede's *Opuscula*. Besides many sonnets, epistles, and homilies in the Saxon language.

ALDPORT, an ancient name for Manchester. See MANCHESTER.

ALDRED, abbot of Tavistock, was promoted to the bishopric of Worcester in the year 1046. He was so much in favour with King Edward the Confessor, and had so much power over his mind, that he obliged him to be reconciled with the worst of his enemies, particularly with Swane son of the earl Goodwin, who had revolted against him, and came with an army to invade the kingdom. Aldred also restored the union and friendship between king Edward and Griffin king of Wales. He took afterwards a journey to Rome, and being returned into England, in the year 1054, he was sent embassador to the emperor Henry II.; he staid a whole year in Germany, and was very honourably entertained by Herman archbishop of Cologn, from whom he learned many things relating to ecclesiastical discipline, which on his return he established in his own diocese. In the year 1058 he went to Jerusalem, which no archbishop or bishop of England had ever done before him. Two years after he returned to England; and Kinsius archbishop of York dying the 22d of December 1060, Aldred was elected in his stead on Christmas day following, and thought fit to keep his bishopric of Worcester with the archbishopric of Canterbury, as some of his predecessors had done. Aldred went soon after to Rome, in order to receive the Pallium from the Pope: He was attended by Toston earl of Northumberland, Giso bishop of Wells, and Walter bishop of Hereford. The pope received Tos-

Aldred. ton very honourably, and made him sit by him in the synod which he held against the Simonists. He granted to Giso and Walter their request, because they were tolerably well learned, and not accused of simony. But Aldred being by his answers found ignorant, and guilty of simony, the pope deprived him very severely of all honours and dignities; so that he was obliged to return without the Pallium. On his way home he and his three fellow-travellers were attacked by some robbers, who took from them all that they had, though they did not offer to kill them. This obliged them to return to Rome; and the pope, either out of compassion, or by the threatenings of the earl of Northumberland, gave Aldred the Pallium; but he was obliged to resign his bishopric of Worcester. However, as the archbishopric of York had been almost entirely ruined by the many invasions of foreigners, king Edward gave the new archbishop leave to keep twelve villages or manors which belonged to the bishopric of Worcester. Edward the Confessor dying in 1066, Aldred crowned Harold his successor. He also crowned William the Conqueror, after he had made him take the following oath, viz. that he would protect the holy church of God and their leaders; that he would establish and observe righteous laws; that he would entirely prohibit and suppress all rapines and unjust judgments. He was so much in favour with the conqueror, that this prince looked upon him as a father; and, though imperious in regard to every body else, he yet submitted to obey this archbishop: John Bromton gives us an instance of the king's submission, which at the same time shows the prelate's haughtiness.—It happened one day, as the archbishop was at York, that the deputy-governor or lord-lieutenant going out of the city with a great number of people, met the archbishop's servants, who came to town with several carts and horses loaded with provisions. The governor asked them to whom they belonged; and they having answered they were Aldred's servants, the governor ordered that all these provisions should be carried to the king's store-house. The archbishop sent immediately some of his clergy to the governor, commanding him to deliver the provisions, and to make satisfaction to St Peter, and to him the saint's vicar, for the injury he had done them; adding, that if he refused to comply, the archbishop would make use of his apostolic authority against him, (intimating thereby that he would excommunicate him). The governor, offended at this proud message, used the persons whom the archbishop had sent him very ill, and returned an answer as haughty as the message was. Aldred thereupon went to London to make his complaint to the king; but in this very complaint he acted with his wonted insolence; for meeting the king in the church of St Peter at Westminster, he spoke to him in these words: "Hearken, O William: when thou wast but a foreigner, and "God, to punish the sins of this nation, permitted thee "to become master of it, after having shed a great deal "of blood, I consecrated thee, and put the crown "upon thy head with blessings; but now, because "thou hast deserved it, I pronounce a curse over thee, "instead of a blessing, since thou art become the "persecutor of God's church, and of his ministers, and "hast broken the promises and the oaths which thou "madest to me before St Peter's altar." The king, terrified at this discourse, fell upon his knees, and humbly begged the prelate to tell him, by what crime he had deserved so severe a sentence. The noblemen, who were present, were enraged against the archbishop, and loudly cried out he deserved death, or at least banishment, for having offered such an injury to his sovereign, and they pressed him with threatenings to raise the king from the ground. But the prelate, unmoved at all this, answered calmly, "Good men, let "him lie there, for he is not at Aldred's but at St "Peter's feet; he must feel St Peter's power, since he "dared to injure his vicegerent." Having thus reproved the nobles by his episcopal authority, he vouchsafed to take the king by the hand, and to tell him the ground of his complaint. The king humbly excused himself, by saying he had been ignorant of the whole matter; and begged of the noblemen to intreat the prelate, that he might take off the curse he had pronounced, and to change it into a blessing. Aldred was at last prevailed upon to favour the king thus far; but not without the promise of several presents and favours, and only after the king had granted him to take such a revenge on the governor as he thought fit. Since that time (adds the historian) none of the noblemen ever dared to offer the least injury. It may be questioned, which was more surprising here, whether the archbishop's haughtiness, who dared to treat his sovereign after so unbecoming a manner; or the king's stupidity, who suffered such insolence and audaciousness from a priest?—The Danes having made an invasion in the north of England in the year 1068, under the conduct of Harold and Canute the sons of king Swane, Aldred was so much afflicted at it, that he died of grief the 11th of September in that same year, having besought God that he might not see the desolation of his church and country. Aldred, Aldrich.

ALDRICH (Robert), bishop of Carlisle, was born at Burnham in Buckinghamshire about the year 1493, and educated at Eaton-school; from whence, in 1507, he was elected scholar of King's College, Cambridge, where he took his degree in arts, and was afterwards proctor of the university. In 1525, he was appointed master of Eaton school, then became fellow of that college, and finally provost. In 1529, he went to Oxford, where, being first incorporated bachelor of divinity, in the following year he proceeded doctor in that faculty: in 1531, he was made arch-deacon of Colchester; in 1534, canon of Windsor; and the same year, registrary of the order of the garter. He was consecrated bishop of Carlisle in the year 1537, and died at Horncastle in Lincolnshire in 1556. He wrote, 1. *Epistola ad Gul. Hormanum*, in Latin verse; printed in Horman's *Antibossican*, Lond. 1521, of which book Pitts erroneously makes Aldrich the author. 2. *Epigrammata varia.* 3. *Latin verses, and another epistle to Horman*, prefixed to the *Vulgaria puerorum* of that author, Lond. 1519, 4to. 4. *Answers to certain queries concerning the abuses of the mass*; also *about receiving the sacrament.*

Aldrich (Dr Henry), an eminent English divine and philosopher, born at London in 1647, was educated at Westminster school under the famous Dr Busby, and admitted of Christ-church college, Oxford. He

Aldrich. He had a great share in the controversy with the Papists in the reign of James II. and Bishop Burnet ranks him among those who examined all the points of popery with a solidity of judgment, clearness of argument, depth of learning, and vivacity of writing, far beyond any who had before that time written in our language. He rendered himself so conspicuous, that at the revolution, when Massey the popish dean of Christ-church fled, his deanery was conferred on him. In this station he behaved in an exemplary manner, and that fabric owes much of its beauty to his ingenuity: it was Aldrich who designed the beautiful square called *Peckwater-Quadrangle*, which is esteemed an excellent piece of architecture. In imitation of his predecessor Dr Fell, he published yearly, a piece of some ancient Greek author, as a present to the students of his house: he published *A System of Logic*, with some other pieces; and the revising Claredon's History of the Rebellion was intrusted to him and bishop Spratt; but it doth not appear that they made any additions, or considerable alterations in it, as has been asserted by Mr Oldmixon. Besides his preferments abovementioned, Dr Aldrich was also rector of Wem in Shropshire. He was chosen prolocutor of the convocation in 1702. This worthy person died at Christ-church on the 14th of December 1710. As to his character he was a most universal scholar, and had a taste for all sorts of learning, especially architecture. Sir John Hawkins has favoured the public with several particulars relative to Dr Aldrich's skill in music; and on account of the Doctor's eminence in this respect, Sir John hath given his life, with his head perfixed. His abilities as a musician rank him, we are told, among the greatest masters of the science. He composed many services for the church, which are well known; as are also his anthems, nearly to the number of twenty. He adapted, with great skill and judgment, English words to many of the notes of Palestrina, Carissimi, Victoria, and other Italian composers for the church, some of which are frequently sung in the cathedrals as anthems. By the happy talent which Dr Aldrich possessed, of naturalizing the compositions of the old Italian masters, and accommodating them to an English ear, he increased the stores of his own church. Though the Doctor chiefly applied himself to the cultivation of sacred music, yet, being a man of humour, he could divert himself by producing pieces of a lighter kind. There are two catches of his; the one. "Hark the bonny Christ-church Bells," the other intitled, "a Smoking Catch," to be sung by four men smoking their pipes, which is not more difficult to sing than diverting to hear. His love of Smoking was, it seems, so excessive as to be an entertaining topic of discourse in the university. Such was Dr Aldrich's regard for the advancement of music, and the honour of its professors, that he had formed a design of writing a history of the science; and the materials from which he proposed to compile it are yet extant in the library of his own college. It appears from these materials, that he had marked down every thing which he had met with concerning music and musicians; but that he had wrought no part of them into any kind of form.

Dr Aldrich is of some note as a Latin poet. In the *Musæ Anglicanæ*, we find two elegant copies of verses by him; one on the accession of King William III. and the other on the death of the Duke of Gloucester. Sir John Hawkins hath preserved a humorous translation by him of the well-known English ballad,

"A soldier and a sailor,
"A tinker and a taylor," &c.

The following epigram, intitled "Causa Bibendi," is likewise ascribed to Dr Aldrich:

"Si bene quid memini, Causæ sunt quinque bibendi,
"*Hospitis Adventus*; *præsens Sitis*, atque *futura*;
"Aut *Vini Bonitas*; *quæ libet altera Causa*."

The epigram has been thus translated:

"If on my theme I rightly think,
"There are five reasons why men drink:
"Good wine, a friend, because I'm dry,
"Or lest I should be by and by,
"Or any other reason why."

The translation is not equal to the original. It is evident, from the verses cited and referred to, that Dr Aldrich was of a very cheerful and pleasant turn of mind. Indeed, he is always spoken of as having been a man of wit; and as one who, to his great talents and virtues, joined those amiable qualities, which rendered him the object of general affection, as well as of general esteem and respect. Having never been married, he appropriated his income to works of hospitality and benificence, and in encouraging learning to the utmost of his power, of which he was a most munificent patron, as well as one of the greatest men in England, if considered as a christian or a gentleman. He had always the interest of his college at heart, whereof he was an excellent governor. And, as he was remarkable for modesty and humility, concealing his name to those several learned tracts he published, so at his death he appointed to be buried without any memorial in the cathedral; which his thrifty nephew complied with, depositing him on the south side of bishop Fell's grave, December 22, eight days after his decease; which happened in the 63d or 64th year of his age.

Aldrovandus. ALDROVANDUS (Ulysses), professor of philosophy and physic at Bologna, the place of his nativity. He was a most curious inquirer into natural history, and travelled into the most distant countries on purpose to inform himself of their natural productions. Minerals, metals, plants, and animals, were the objects of his curious researches; but he applied himself chiefly to birds, and was at great expence to have figures of them drawn from the life. Aubert le Mire says, that he gave a certain painter, famous in that art, a yearly salary of 200 crowns, for 30 years and upwards; and that he employed at his own expence Lorenzo Bennini and Cornelius Swintus, as well as the famous engraver Christopher Coriolanus. These expences ruined his fortune, and at length reduced him to the utmost necessity; and it is said that he died blind in an hospital at Bologna, at a great age, in 1605. Mr Bayle observes, that antiquity does not furnish us with an instance of a design so extensive and so laborious as that of Aldrovandus, with regard to natural history; that Pliny has treated of more kinds of subjects, but only touches lightly on them, saying but a little upon any thing, whereas Aldrovandus has collected all he could meet with. His compilation, or that compiled upon his

his plan, consists of 13 volumes in folio, several of which were printed after his death. He himself published his Ornithology, or History of Birds, in three folio volumes, in 1599; and his seven books Of Insects, which make another volume of the same size. The volume Of Serpents, three Of Quadrupeds, one Of Fishes, that Of exanguious Animals, the History of Monsters, with the Supplement to that of Animals, the treatise Of Metals, and the Dendrology or History of Trees, were published at several times after the death of Aldrovandus, by the care of several persons; and Aldrovandus is the sole author only of the first six volumes of this work, the rest having been finished and compiled by others, upon the plan of Aldrovandus: a most extensive plan, wherein he not only relates what he has read in naturalists, but remarks also what historians have written, legislators ordained, and poets feigned: he explains also the different uses which may be made of the things he treats of, in common life, in medicine, architecture, and other arts; in short, he speaks of morality, proverbs, devices, riddles, hieroglyphics, and many other things which relate to his subject.

ALDROVANDA, in botany, a genus of the pentandria order, belonging to the pentagynia class of plants; of which there is but one species. The calyx is divided into five parts; the petals are five; and the capsule has five valves, with ten seeds. It is a native of Italy and the Indies; and has no English name.

ALDUABIS (anc. geog.), a river of Celtic Gaul, which rising from Mount Jura, separating the Sequani from the Helvetii, and running through the county of Burgundy, or the Franche Comté, environs almost on every side the city of Besançon; and running by Dole, falls into the Saone near Chalone. In Cæsar it is called *Alduasdubis*; in Ptolemy, *Dubis*: now *le Doux*.

ALE, a fermented liquor obtained from an infusion of malt, and differing from beer chiefly in having a less proportion of hops. (See BREWING.). This liquor, the natural substitute of wine in such countries as could not produce the grape, was originally made in Egypt, the first planted kingdom, on the dispersion from the east, that was supposed unable to produce grapes. And, as the Noachian colonies pierced further into the west, they found, or thought they found, the same defect, and supplied it in the same manner. Thus the natives of Spain, the inhabitants of France, and the aborigines of Britain, all used an infusion of barley for their ordinary liquor: and it was called by the various names of *Cælia* and *Ceria* in the first country, *Cerevisia* in the second, and *Curmi* in the last; all literally importing only *the strong water*.

"All the several nations (says Pliny) who inhabit the west of Europe, have a liquor with which they intoxicate themselves, made of corn and water. The manner of making this liquor is somewhat different in Gaul, Spain, and other countries, and is called by many various names; but its nature and properties are every where the same. The people of Spain, in particular, brew this liquor so well, that it will keep good a long time. So exquisite is the cunning of mankind, in gratifying their vicious appetites, that they have thus invented a method to make water itself intoxicate." The method in which the ancient Britons, and other Celtic nations, made their ale, is thus described by Isidorus and Orosius. "The grain is steeped in water and made to germinate, by which its spirits are excited and set at liberty; it is then dried and grinded; after which it is infused in a certain quantity of water; which being fermented, becomes a pleasant, warming, strengthening, and intoxicating liquor." This ale was most commonly made of barley; but sometimes of wheat, oats, and millet.

Anciently the Welch and Scots had also two kinds of ale, called *common ale* and *spiced ale*; and their value was thus ascertained by law: "If a farmer hath no mead, he shall pay two casks of spiced ale, or four casks of common ale, for one cask of mead." By this law, a cask of spiced ale, nine palms in height, and 18 palms in diameter, was valued at a sum of money equal in efficacy to L. 7. 10s. of our present money; and a cask of common ale, of the same dimensions, at a sum equal to L. 3. 15s. This is a sufficient proof, that even common ale in this period was an article of luxury among the Welch, which could only be obtained by the great and opulent. Wine seems to have been quite unknown even to the kings of Wales in this period, as it is not so much as once mentioned in their laws; though Giraldus Cambrensis, who flourished about a century after the conquest, acquaints us, that there was a vineyard in his time at Maenarper, near Pembroke, in South Wales.

Ale was the favourite liquor of the Anglo-Saxons and Danes, as it had been of their ancestors the ancient Germans. Before their conversion to Christianity, they believed that drinking large and frequent draughts of ale was one of the chief felicities which those heroes enjoyed who were admitted into the hall of Odin.

There are various sorts of ale known in Britain, particularly *pale* and *brown*: the former is brewed from malt slightly dried; and is esteemed more viscid than the latter, which is made from malt more highly dried or roasted.

Pale ale brewed with hard waters, as those of springs and wells, is judged the most wholesome, in regard the mineral particles tend to prevent the cohesions of those drawn from the grain, and enable them to pass the proper secretions the better; softer waters, as those of rivers, and rain, seem better suited to draw out the substance of high-dried malts which retain many igneous particles, best absorbed in a smooth vehicle.

In Staffordshire, they have a secret of fining ale in a very short time. Plot conjectures it to be done by adding alum, or vinegar, in the working.

Ale is prepared various ways, and of various ingredients, as of wheat, rye, millet, oats, barley, the berries of the quick-bean, &c.

Some have found that the juice which bleeds from the birch or sycamore is of great use on this occasion, applied instead of water. It makes one bushel of malt go as far as four in the common way.

Some have a method of preparing ale, so that it will keep, carried to the East or West Indies. The secret is, by mashing twice with fresh malt; boiling twice; and, after shipping it, putting to every five gallons two new-laid eggs whole, to remain therein. It is said, that, in a fortnight's time, the shells will be dissolved; and the eggs become like wind-eggs; and that afterwards the white will disappear and the yolk remain untouched.

Ale is generally held to be more diuretic than beer, in regard it is smoother, more softening, and relaxing; so that when urine is to be promoted by facilitating the passage, ale is most likely to effect it.

Ale is flatulent; and hence sometimes produces colics, and the cholera morbus: it is acescent; but it does not produce calcareous diseases, as has been asserted.

If malt-liquor, of any degree of strength, is become flat and tartish, as it is used, it should be drawn out of the cask into a jug, in which as many drams of powdered chalk is put as there are to be pints of liquor; thus a new ferment will be raised, a sprightly taste will be restored to the liquor, and its acidity will be destroyed. Tart liquors of this kind are apt to produce a dysury, strangury, or a gonorrhœa; in which cases, a small quantity of brandy may be taken.

The consumption of ale in Great Britain is incredible. It was computed twenty years ago at the value of four millions yearly, including Great Britain and Ireland.

The duties on ale and beer make a principal branch of the revenue in Britain. They were first imposed by the 12th of Car. II. and have been continued by several subsequent acts of parliament to first Geo. III. which lays an additional duty of 3d. per barrel. In the whole, the brewer of ale and beer for sale shall pay 8s. for every barrel of either, above 6s. a barrel; and for every barrel of 6s. or under, the sum of 1s. 4d.

Medicated ALES, those wherein medicinal herbs have been infused, or added during the fermentation. See PHARMACY, (Index.)

Gill-ALE, is that in which the dried leaves of gill or ground-ivy have been infused. It is esteemed abstersive and vulnerary, and consequently good in disorders of the breast and obstructions of the viscera.

ALE-*Conner*, an officer in London, who inspects the measures used in public houses. There are four aleconners, who are all chosen by liverymen in common hall on midsummer-day.

ALE-*Houses* must be licensed by justices of the peace, who take recognizances of the persons licensed, and of their sureties, viz. 10l. each, that they will not suffer unlawful gaming, nor other disorderly practices in their houses. Every person, excepting those who sell ale in fairs, neglecting to procure a license, is liable to a penalty of 40s. for the first offence, 4l. for the second, and 6l. for the third, with all costs. The licence is granted on the first of September, or within twenty days after, at a general meeting of the justices for the division to which he belongs, upon his producing a certificate to his character, unless by living in a city or town-corporate, this last circumstance is dispensed with, and continues in force for one year only. Alehouse keepers, selling ale in short measure, are liable to a penalty not exceeding 40s. and not less than 10s. and likewise to a fine of 10s. for permitting tipling, &c.

By 29th Geo. II. c. 12. persons keeping ale-houses in Scotland shall be licensed as in England, and the justices there shall meet annually to license ale-houses; on each of which licenses a fee of 1s. is payable to the clerk of the peace. Magistrates of Royal boroughs shall meet yearly for the like purpose; but where there shall not be a sufficient number of magistrates to act in any royal borough, justices may grant licenses, to be in force for one year only. Ibid.

Persons in Scotland convicted of keeping unlicensed ale-houses shall forfeit for the first offence 5s. for the second 10s. for the third 20s. and to be disqualified; and for every subsequent offence 40s. to be levied by distress and sale, one moiety to the informer, the other to the poor of the parish. Conviction to be intimated to the offender, and certified to the clerk of the peace, and recorded: but persons aggrieved may appeal to the quarter sessions. Ibid.

Licenses for houses on the military roads in Scotland shall be issued on payment of 1s. only to the clerk of the peace: making out licenses before the same be stamped, is a penalty of 10l. and making them contrary to the intention of this act, 5l. and the same shall be vacated, unless the duty and fine be paid, and the receipt produced, and license stamped. Ibid.

ALE-*Silver*, a tax paid annually to the lord-mayor of London, by all who sell ale within the city.

ALEA, in Roman antiquity, denotes in general all manner of games of chance; but, in a more restricted sense, was used for a particular game played with dice and tables, not unlike our backgammon.

ALEANDER (Jerome), cardinal and archbishop of Brindisi, was born in 1480; and distinguished himself at the beginning of the reformation, by the opposition he made to Luther: for being sent into Germany as the pope's nuncio in 1519, he acted, as occasion served, in the character both of ambassador and doctor; and declaimed three hours together against Luther's doctrine before the diet of Worms, but could not prevent that celebrated reformer from being heard in that diet. He published several works, and died at Rome in 1542.

ALEANDER (Jerome), a learned man of the seventeenth century, born in the principality of Friuli, of the same family with the preceding. When he went to Rome, he was employed as secretary under cardinal Octavius Bandini, and discharged this office with great honour for almost twenty years. He afterwards, by the persuasion of Urban VIII. who had a great esteem for him, become secretary to Cardinal Barberini, whom he accompanied to Rome when he went there in the character of legate *à latere*, and in whose service he died in 1631. He was one of the first members of the academy of Humorists, wrote a learned treatise in Italian on the device of the society, and displayed his genius on many different subjects. Barberini gave him a magnificent funeral at the academy of Humorists; the academists carried his corps to the grave; and Gasper Simeonibus, one of the members, made his funeral oration.

ALECTO, one of the FURIES, daughter of Acheron and Night, or, as others would have it, of Pluto and Proserpine.

ALECTORIA, a stone said to be formed in the gall bladders of old cocks, to which the ancients ascribed many fabulous virtues. This is otherwise called *Alectorius Lapis*, sometimes *Alectorolithos*, in English the *cock-stone*. The more modern naturalists hold the *alectorius lapis* to be originally swallowed down, not generated in, the stomach or gizard of cocks and capons. It is known that many of the fowl-kind make a practice of swallowing pebbles, as it is supposed to be of service in the business of trituration and digestion.

ALECTOROMANTIA, in antiquity, a species of divination performed by means of a cock. This is

A-lee || Alembert.

otherwise rcalled *Alectryomancy*; of which there appear to have been different species. But that most spoken of by authors was in the following manner: A circle being described on the ground, and divided into twenty-four equal portions, in each of these spaces was written one of the letters of the alphabet, and on each of the letters was laid a grain of wheat; after which, a cock being turned loose in the circle, particular notice was taken of the grains picked up by the cock, because the letters under them, being formed into a word, made the answer desired. It was thus, according to Zonarus, that Libanius and Jamblicus sought who should succeed the emperor Valens; and the cock eating the grains answering to the spaces ΘΕΟΔ, several whose names began with those letters, as Theodotus, Theodistes, Theodulous, &c. were put to death, which did not hinder, but promote, Theodosius to the succession. But the story, however current, is but ill supported: It has been called in question by some, and refuted by others, from the silence of Marcellinus Socrates, and other historians of that time.

A-LEE, in the sea-language, a term only used when the wind, crossing or flanking the line of a ship's course, presses upon the masts and sails so as to make her incline to one side, which is called the lee-side: hence, when the helm is moved over to this side, it is said to be *a lee*, or *hard-a-lee*.

ALEGAMBE (Philip), a celebrated Jesuit, born at Brussels in 1592, distinguished himself by publishing a Bibliotheque of the writers of his order, and died at Rome in 1652.

ALEGRETTE, a small town of Portugal, in Alentejo, on the confines of Port Alegre, on the river Caja, which falls into the Guadiana, a little below Bajadoz, near the frontiers of Spanish Estremadura. It is a very pretty town, and finely situated; seven miles south-east of Port Alegre, and thirty miles north of Elvas. W. Long. 5. 20. N. Lat. 39. 6.

ALEIUS CAMPUS (anc. geog.), a plain in Cilicia, on this side the river Pyramus, near the mountain Chimera, famous for Bellerophon's wandering and perishing there, after being thrown off Pegasus; which is the reason of the appellation.

ALEMANIA, or ALLEMANIA, (anc. geog.) a name of Germany, but not known before the time of the Antonines, and then used only for a part. After the Marcomanni and their allies had removed from the Rhine, a rabble, or collection of people from all parts of Gual, as the term *Alemanni* denotes, prompted either by levity or poverty, occupied the Agri, called *Decumates* by Tacitus, because they held them on a tithe; now supposed to be the dutchy of *Wirtemburgh*. Such appear to be the small beginnings of Alemania, which was in after-times greatly enlarged: but still it was considered as a distinct part; for Caracalla, who conquered the Alemanni, assumed the surname both of *Alemannicus* and *Germanicus*.

ALEMBDAR, and officer in the court of the Grand Signior, who bears the green standard of Mahomet, when the sultan appears in public on any solemn occasion.

ALEMBERT (John le Rond d'), an eminent French philosopher, was born at Paris in 1717. He derived the name of John le Rond from that of the church near which, after his birth, he was exposed as a foundling. His father, informed of this circumstance, listened to the voice of nature and duty, took measures for the proper education of his child, and for his future subsistence in a state of ease and independence.

He received his first education in the College of the Four Nations, among the Jansenists, where he gave early marks of capacity and genius. In the first year of his philosophical studies, he composed a Commentary on the epistle of St Paul to the Romans. The Jansenists considered this production as an omen that portended to the party of Port-Royal a restoration to some part of their ancient splendor, and hoped to find one day in M. d'Alembert a second Pascal. To render this resemblance more complete, they engaged their rising pupil in the study of the mathematics; but they soon perceived that his growing attachment to this science was likely to disappoint the hopes they had formed with respect to his future destination; they, therefore, endeavoured to divert him from this line; but their endeavours were fruitless.

At his leaving college, he found himself alone and unconnected in the world; and sought an asylum in the house of his *nurse*. He comforted himself with the hope, that his fortuue, though not ample, would better the condition and subsistence of that family, which was the only one that he could consider as his own: Here, therefore, he took up his residence, resolving to apply himself entirely to the study of geometry: And here he lived, during the space of forty years, with the greatest simplicity, discovering the augmentation of his means only by encreasing displays of his beneficence, concealing his growing reputation and celebrity from these honest people, and making their plain and uncouth manners the subject of good-natured pleasantry and philosophical observation. His good nurse perceived his ardent activity; heard him mentioned as the writer of many books; but never took it into her head that he was a great man, and rather beheld him with a kind of compassion. "*You will never*," said she to him one day, "*be any thing but a philosopher—and what is a philosopher?—a fool, who toils and plagues himself during his life, that people may talk of him when* HE IS NO MORE.

As M. d'Alembert's fortune did not far exceed the demands of necessity, his friends advised him to think of a profession that might enable him to augment it. He accordingly turned his views to the law, and took his degrees in that line; but soon abandoned this plan, and applied to the study of medicine. Geometry, however, was always drawing him back to his former pursuits, and after many ineffectual efforts to resist its attractions, he renounced all views of a lucrative profession, and gave himself over entirely to mathematics and poverty.

In the year 1741 he was admitted member of the Academy of Sciences; for which distinguished literary promotion, at such an early age, he had prepared the way by correcting the errors of a celebrated work*, which was deemed *classical* in France in the line of geometry. He afterwards set himself to examine, with deep attention and assiduity, what must be the motion of a body which passes from one fluid into another more dense, in a direction not perpendicular to the surface separating the two fluids. Every one knows the phenomenon which happens in this case, and which amuses

*The *Analyse demontree* of F. Beinau.

Alembert. amuses children under the denomination of *Ducks and Drakes*; but M. d'Alembert was the first who explained it in a satisfactory and philosophical manner.

Two years after his election to a place in the academy, he published his *Treatise on Dynamics*. The new principle developed in this treatise consisted in establishing equality, at each instant, between the changes that the motion of a body has undergone, and the forces or powers which have been employed to produce them; or to express the thing otherwise, in separating into *two parts* the action of the moving powers, and considering the *one* as producing alone the motion of the body, in the second instant, and the *other* as employed to destroy that which it had in the first.

So early as the year 1744, M. d'Alembert had applied this principle to the theory of the equilibrium, and the motion of fluids; and all the problems before solved by geometricians became, in some measure, its corollaries. The discovery of this new principle was followed by that of a new calculus, the first trials of which were published in a *Discourse on the general Theory of the Winds*, to which the prize-medal was adjudged by the academy of Berlin in the year 1746, and which was a new and brilliant addition to the fame of M. d'Alembert. This new calculus of partial differences he applied, the year following, to the problem of vibrating chords, whose solution, as well as the theory of the oscillations of the air and the propagation of sound, had been given but incompletely by the geometricians who preceded him, and these were his masters or his rivals.

In the year 1749 he furnished a method of applying his principle to the motion of any body of a given figure; and he solved the problem of the precession of the equinoxes, determined its *quantity*, and explained the phenomenon of the nutation of the terrestrial axis discovered by Dr Bradley.

In 1752, M. d'Alembert published a treatise on the *Resistance of Fluids*, to which he gave the modest title of an *Essay*; but which contains a multitude of original ideas and new observations. About the same time he published, in the Memoirs of the Academy of Berlin, *Researches concerning the Integral Calculus*, which is greatly indebted to him for the rapid progress it has made in the present century.

While the studies of M. d'Alembert were confined to geometry, he was little known or celebrated in his native country. His connections were limited to a small society of select friends: he had never seen any man in high office except M. d'Argenson. Satisfied with an income which furnished him with the necessaries of life, he did not aspire after opulence or honours; nor had they been hitherto bestowed upon him, as it is easier to confer them on those who solicit them, than to look out for men who deserve them. His cheerful conversation, his smart and lively sallies, a happy knack at telling a story, a singular mixture of malice of speech with goodness of heart, and of delicacy of wit with simplicity of manners, rendered him a pleasing and interesting companion, and his company consequently was much sought after in the fashionable circles. His reputation, at length, made its way to the throne, and rendered him the object of royal attention and beneficence. He received also a pension from government, which he owed to the friendship of Count d'Argenson. Alembert.

The tranquillity of M. d'Alembert was abated when his fame grew more extensive, and when it was known beyond the circle of his friends, that a fine and enlightened taste for literature and philosophy accompanied his mathematical genius. Our author's eulogist ascribes to envy, detraction, and to other motives nearly as ungenerous, all the disapprobation, opposition, and censure that M. d'Alembert met with on account of the publication of the famous Encyclopedical Dictionary of Arts and Sciences, in conjunction with Diderot. None surely will refuse the well-deserved tribute of applause to the eminent displays of genius, judgment, and true literary taste, with which M. d'Alembert has enriched the great work now mentioned. Among others, the Preliminary Discourse he has affixed to it, concerning the rise, progress, connections, and affinities of all the branches of human knowledge, is perhaps one of the most capital productions of which the philosophy of the present age can boast. Nor will it be disputed, that the master-builders of this new and stupendous *temple* of science, for the worship of NATURE, had also really in view the advancement of human knowledge, and the improvement of the arts and sciences. This, no *true*, no candid philosopher, will call in question. But that in the *inner court* of this temple there was a confederacy formed against all those who looked higher than *nature*, for the principal object of their veneration and confidence, is a fact too palpable, nay too boldly avowed, to stand in need of any proof. *Monthly Review for Mar. 1787.*

Some time after this, d'Alembert published his Philosophical, Historical, and Philological Miscellanies. These were followed by the Memoirs of Christina Queen of Sweden; in which M. d'Alembert showed that he was acquainted with the natural rights of mankind, and was bold enough to assert them. His *Essay on the Intercourse of Men of Letters with persons high in Rank and Office*, wounded the former to the quick, as it exposed to the eyes of the public the ignominy of those servile chains, which they feared to shake off, or were proud to wear. A lady of the court hearing one day the author accused of having exaggerated the despotism of the great, and the submission they require, answered slyly, *If he had consulted me, I would have told him still more of the matter*.

M. d'Alembert gave very elegant specimens of his literary abilities in his translation of some select pieces of Tacitus. But these occupations did not divert him from his mathematical studies: for about the same time he enriched the Encyclopédie with a multitude of excellent articles in that line, and composed his *Researches on several important Points of the System of the World*, in which he carried to a higher degree of perfection the solution of the problem of the perturbation of the planets, that had several years before been presented to the Academy.

In 1759 he published his *Elements of Philosophy*: a work extolled as remarkable for its precision and perspicuity; in which, however, are some tenets relative both to metaphysics and moral science, that are far from being admissible.

The resentment that was kindled (and the disputes that followed it) by the article *Geneva*, inserted in the Encyclopédie,

Encyclopédie, are well known. M. d'Alembert did not leave this field of controversy with flying colours. Voltaire was an auxiliary in the contest: but as, in point of candour and decency, he had no reputation to lose; and as he weakened the blows of his enemies, by throwing both them and the spectators into fits of laughter, the issue of the war gave him little uneasiness. It fell more heavily on d'Alembert; and exposed him, even at home, to much contradiction and opposition.

It was on this occasion that the late king of Prussia offered him an honourable asylum at his court, and the place of president of his academy; and was not offended at his refusal of these distinctions, but cultivated an intimate friendship with him during the rest of his life. He had refused, some time before this, a proposal made by the empress of Russia to intrust him with the education of the Grand Duke;—a proposal accompanied with all the flattering offers that could tempt a man, ambitious of titles, or desirous of making an ample fortune: but the objects of his ambition were tranquillity and study.

In the year 1765, he published his *Dissertation on the Destruction of the Jesuits*. This piece drew upon him a swarm of adversaries, who confirmed the merit and credit of his work by their manner of attacking it.

Beside the works already mentioned, he published nine volumes of memoirs and treatises, under the title of *Opuscules;* in which he has solved a multitude of problems relative to astronomy, mathematics, and natural philosophy; of which our panegyrist gives a particular account, more especially of those which exhibit new subjects, or new methods of investigation.

He published also *Elements of Music*; and rendered, at length, the system of Rameau intelligible; but he did not think the mathematical theory of the sonorous body sufficient to account for the rules of that art. He was always fond of music; which, on the one hand, is connected with the most subtle and learned researches of rational mechanics; while, on the other, its power over the senses and the soul exhibits to philosophers phenomena no less singular and still more inexplicable.

In the year 1772 he was chosen secretary to the French academy. He formed, soon after this preferment, the design of writing the lives of all the deceased academicians, from 1700 to 1772; and in the space of three years he executed this design, by composing 70 eulogies.

M. d'Alembert died on the 29th of October 1783. There were many amiable lines of candour, modesty, disinterestedness, and beneficence, in his moral character; which are described, with a diffusive detail, in his eulogium, by M. Condorcet, *Hist. de l'Acad. Royale des Sciences*, 1783.

ALEMBIC, a chemical vessel usually made of glass or copper, formerly used for distillation. The bottom part, which contained the subject for distillation, is called, from its shape, the *cucurbit;* the upper part, which receives and condenses the steam, is called the *head*, the beak of which is fitted into the neck of a receiver. Retorts, and the common *worm-still*, are now more generally employed.

ALEMBROTH, in the writings of the alchemists, a word used for a sort of fixed alkaline salt, which had the power of the famous alkahest, in dissolving bodies, opening the pores of most or all known substances, and thence, as well as by destroying sulphurs, promoting the separation of metals from their ores.—It is also used for a compound of corrosive mercury and sal ammoniac. See CHEMISTRY.

ALENIO (Julius), a Jesuit, born at Brescia in the republic of Venice. He travelled into the eastern countries; and arrived at Macao in 1610, where he taught mathematics. From thence he went to the empire of China, where he continued to propagate the Christian religion for thirty-six years. He was the first who planted the faith in the province of Xansi, and he built several churches in the province of Fokien. He died in August 1649, leaving behind him several works in the Chinese language.

ALENTEJO, a province of Portugal, between the rivers of Tajo and Guadiana: the soil is very fertile, and the inhabitants laborious and industrious. The principal town is Ebora.

ALENZON, a large handsome town of France, in lower Normandy, with the title of a duchy. It is surrounded with good walls, and flanked with towers. The castle was formerly a place of great consequence, and has held out long sieges. It has but one parish-church, which has a bold and noble front. Among the nunneries, that of St Clair is most remarkable. It is seated on the river Sarte, in a vast open plain, which produces all sorts of corn and fruit. Near it there are quarries of stone fit for building, wherein are found a sort like Bristol stones. The linen made at Alenzon is very good, and sells at Paris. It is 20 miles north of Mans, 63 south-by-west of Rouen, and 88 south-west of Paris. W. Long. 0. 10. N. Lat. 48. 25.

ALEPPO, or HALAB, the capital of the Pachalic, and of all Syria, and the ordinary residence of the pacha, is situated in the vast plain which extends from the Orontes to the Euphrates, and which towards the south terminates in the desart. It is built on eight hills or eminences, on the highest of which the castle is erected, and is supposed to be the ancient Beræa. This mount is of a conic form, and seems in a great measure to be raised with the earth thrown up out of a deep broad ditch which surrounds it. The suburbs to the north-north-east are next in height to this, and those to the west-south-west are much lower than the parts adjacent, and than any other part of the city. The houses are large and commodious, having terraces on their tops, and generally sky-lights in form of a dome to let the light into the rooms, which from their loftiness, the gilding on the window-shutters, cupboard-doors, &c. have at first entrance a very grand and agreeable effect. They are all so equal in height, that there are seldom any steps to ascend or descend in going from one house to another; while several large vaulted streets increase the facility of communication, by affording a passage to every part of the city free from the embarrassment of the open streets. They are carefully paved; have gutters and a foot-pavement on each side; and the middle of the street is laid with brick, the small end upwards, for the convenience of the horses. There is also a cleanliness observed here unknown to the other cities of Turkey, and which is not attended with the trouble of scavengers, there being

Aleppo. being ass-drivers who go about the city and take up the rubbish and dust, which each inhabitant is obliged to sweep together; and though the heat of the climate renders this labour more easy, the same heat obliges them to greater cleanliness, in order to preserve the salubrity of the air.

The mosques in Aleppo are numerous, and some few of them magnificent. Before each of them is an area, with a fountain in the middle, designed for ablutions before prayers; and behind some of the larger there are little gardens. There are many large khans, or caravanseras, consisting of a capacious square, on all sides of which are a number of rooms, built on a ground-floor, used occasionally for chambers, ware-houses, or stables. Above stairs there is a colonade or gallery on every side, in which are the doors of a number of small rooms, wherein the merchants, as well strangers as natives, transact most of their business.

The bazars or market-places are long covered narrow streets, on each side of which are a great number of small shops, just sufficient to hold the tradesman and his goods, the buyer being obliged to stand without. Each separate branch of business has a particular bazar, which is locked up, as well as the streets, an hour and a half after sun-set: but the locks are of wood, though the doors are cased with iron. The slaughter-houses are in the suburbs, open to the fields. The tanners have a khan to work in near the river. To the southward in the suburbs they burn lime; and a little beyond that there is a village where they make ropes and catgut. On the opposite side of the river, to the westward, there is a glass-house, where they make a coarse white glass, in the winter only; for the greatest part of this manufacture is brought from a village 35 miles westward.

The situation of Aleppo, beside the advantage of a rich and fruitful soil, possesses also that of a stream of fresh water, which never becomes dry. This rivulet, which is about as large as that of the Gobelins at Paris, or the New River near London, rises in the mountains of Aentab, and terminates six leagues below Aleppo, in a morass full of wild boars and pelicans. Near Aleppo, its banks, instead of the naked rocks which line them in the upper part of its course, are covered with a fertile earth, and laid out in gardens, or rather orchards, which, in a hot country, and especially in Turkey, cannot but be delightful. The city is in itself one of the most agreeable in Syria, and is perhaps the cleanest and best built of any in Turkey. On whatever side it is approached, its numerous minarets and domes present an agreeable prospect to the eye, fatigued with the continued sameness of the brown and parched plains. In the centre is an artificial mountain surrounded by a dry ditch, on which is a ruinous fortress. From hence we have a fine prospect of the whole city, and to the north discover the snowy tops of the mountains of Bailan; and on the west, those which separate the Orontes from the sea; while to the south and east, the eye can discern as far as the Euphrates. In the time of Omar, this castle stopped the progress of the Arabs for several months, and was at last taken by treachery, but at present would not be able to resist the feeblest assault. Its slight wall, low, and without a buttress, is in ruins; its little old towers are in no better condition; and it has not four cannot fit for service, not excepting a culverine nine feet long, taken from the Persians at the siege of Bassora. Three hundred and fifty Janisaries, who should form the garrison, are busy in their shops, and the aga scarcely finds room in it to lodge his retinue. It is remarkable that this aga is named immediately by the Porte, which, ever suspicious, divides as much as possible the different offices. Within the walls of the castle is a well, which, by means of a subterraneous communication, derives its water from a spring a league and a quarter distant. In the environs of the city, we find a number of large square stones, on the top of which is a turban of stone, which are so many tombs. There are many rising grounds round it, which, in case of a siege, would greatly facilitate the approaches of the assailants. Such, among others, is that on which the house of the Dervichies stands, and which commands the canal and the rivulet: Aleppo, therefore, cannot be esteemed a place of importance in war, though it be the key of Syria to the north; but, considered as a commercial city, it has a different appearance. It is the emporium of Armenia and the Diarbekar; sends caravans to Bagdad and into Persia; and communicates with the Persian gulph and India, by Bassora, with Egypt and Mecca by Damascus, and with Europe by Skandaroon (*Alexandretta*) and Lataki. Commerce is there principally carried on by barter. The chief commodities are raw or spun cottons, clumsy linens fabricated in the villages; silk stuffs manufactured in the city, copper, *bourers* (coarse cloths) like those of Rouen, goats hair brought from Natolia; the gall nuts of the Kourdestan, the merchandise of India, such as shawls and muslins, and pistachio nuts of the growth of the neighbourhood. The articles supplied by Europe are the Languedoc cloths, cochineal, indigo, sugar, and some other groceries. The coffee of America, though prohibited, is introduced, and serves to mix with that of Moka. The French have at Aleppo a consul and seven counting-houses; the English and the Venetians two, and the merchants of Leghorn and Holland one. The emperor appointed a consul there in 1784, in the person of a rich Jew merchant, who shaved his beard to assume the uniform and the sword. Russia has also sent one very lately. Aleppo is not exceeded in extent by any city in Turkey, except Constantinople and Cairo, and perhaps Smyrna. The number of inhabitants has been computed at 200,000; but in these calculations certainty is impossible. However, if we observe that this city is not larger than Nantes or Marseilles, and that the houses consist only of one story, we shall perhaps not think it probable they exceed 100,000. The people of this city, both Turks and Christians, are with reason esteemed the most civilized in all Turkey; and the European merchants no where enjoy so much liberty, or are treated with so much respect.

The air of Aleppo is very dry and piercing, but at the same time very salubrious for all who are not troubled with asthmatic complaints. The city, however, and the environs, are subject to a singular endemnial disorder, which is called the ringworm or pimple of Aleppo; it is in fact a pimple which is at first inflammatory, and at length becomes an ulcer of the size of the nail. The usual duration of this ulcer is one year;

it commonly fixes on the face, and leaves a ſcar which diſfigures almoſt all the inhabitants. It is alleged that every ſtranger who reſides there three months is attacked with it; experience has taught that the beſt mode of treatment is to make uſe of no remedy. No reaſon is aſſigned for this malady: but M. Volney ſuſpects it proceeds from the quality of the water, as it is likewiſe frequent in the neighbouring villages, in ſome parts of the Diarbekar, and even in certain diſtricts near Damaſcus, where the ſoil and the water have the ſame appearances. Of the Chriſtian inhabitants the greater number are Greeks, next to them the Armenians, then the Syrians, and laſtly the Maronites; each of whom have a church in the city called *Judida*; in which quarter, and the parts adjacent, moſt of them reſide. The common language is the vulgar Arabic, but the Turks of condition uſe the Turkiſh. Moſt of the Armenians can ſpeak the Armenian, ſome few Syrians underſtand Syriac, and many of the Jews Hebrew; but ſcarce one of the Greeks underſtand a word of Greek. The people in general are of a middle ſtature, and tolerably well proportioned; but they ſeem neither vigorous nor active. Both ſexes are handſome when young: but the beard ſoon disfigures the men: and the women, as they come early to maturity, alſo fade very ſoon; females are generally married from 14 to 18 years of age, and many under 14. The people of rank here are polite and affable, making allowances for that ſuperiority which the Mahometan religion inſtructs its votaries to aſſume over all who hold a different faith. Their bread is generally of wheat flour made into thin cakes, but very ill prepared, and is generally eaten as ſoon as it comes out of the oven. The principal people have ſome loaves of a finer flour, which are well fermented and baked. Beſides theſe, there are a variety of biſcuits, moſt of which are ſtrewed on the top with ſome kind of ſeeds. The Europeans have very good bread, baked and prepared in the French manner. All the inhabitants of both ſexes ſmoke tobacco to great exceſs; even the very ſervants have almoſt conſtantly a pipe in their mouths. Coaches or carriages are not uſed here; therefore perſons of quality ride on horſeback in the city, with a number of ſervants walking before them, according to their rank: ladies of the firſt diſtinction are even compelled to walk on foot in the city, or to any place at a moderate diſtance; in longer journeys they are carried by mules, in a kind of a couch cloſe covered up. There are a number of public bagnios in this city, which are uſed by people of all ranks, except thoſe of the higheſt diſtinction, who commonly have baths and every other convenience in their own houſes. Aleppo is 70 miles eaſt of Scandaroon, on the ſea-coaſt, and 175 north-by-eaſt of Damaſcus. E. Long. 37. 40. N. Lat. 36. 12.

Aleppo (*the Pachalic of*), one of the five governments into which Syria is divided. It comprehends the country extending from the Euphrates to the Mediterranean, between two lines, one drawn from Scandaroon to Beer, along the mountains; the other from Beles to the ſea, by Mara and the bridge of Shoger. This ſpace principally conſiſts of two plains; that of Antioch to the weſt, and that of Aleppo to the eaſt: the north and the ſea coaſt are occupied by conſiderably high mountains, known to the ancients by the names of Amanus and of Rhoſus. In general, the ſoil of this government is fat and loamy. The lofty and vigorous plants which ſhoot up every where after the winter rains prove its fertility, but its actual fruitfulneſs is but little. The greateſt part of the lands lie waſte; ſcarcely can we trace any marks of cultivation in the environs of the towns and villages. Its principal produce conſiſts in wheat, barley, and cotton, which are found eſpecially in the flat country. In the mountains, they rather chooſe to cultivate the vine, mulberry, olive, and fig trees. The ſides of the hills towards the ſea-coaſt are appropriated to tobacco, and the territory of Aleppo to piſtachios. The paſturage is not to be reckoned, becauſe that is abandoned to the wandering hordes of the Turkmen and Curds.

In the greater part of the pachalics the pacha is, as his title imports, at once the viceroy and farmer general of the country; but in that of Aleppo he does not poſſeſs the latter office. This the Porte has beſtowed on a *mehaſſel* or collector, who is immediately accountable for what he receives. His leaſe is only for a year. The preſent rent of his farm is 800 purſes (above L.40,000); but to this muſt be added the price of the *babouchet* (Turkiſh ſlippers), or a preſent of three or four thouſand pounds, to purchaſe the favour of the viſir and men in office. For theſe two ſums the farmer receives all the duties of the government; which are, firſt, The produce of import and export duties on merchandiſe coming from Europe, India, and Conſtantinople, and on that exported in exchange. Secondly, The taxes paid by the herds of cattle brought every year by the Turkmen and Curds from Armenia and the Diarbekar, to be ſold in Syria.—Thirdly, The fifth of the ſalt-works of Djeboul. And laſtly, the miri, or land-tax. Theſe united may produce about L.60,000.

The pacha, deprived of this lucrative branch of the adminiſtration, receives a fixed allowance of about L.8300. This revenue has always been inadequate to the expences; for, beſides the troops he is obliged to maintain, and the reparation of the highways and fortreſſes, the expences of which he is obliged to defray, he is under the neceſſity of making large preſents to the miniſters, in order to keep his place; but the Porte adds to the account the contributions he may levy on the Curds and Turkmen, and his extortions from the villages and individuals; nor do the pachas come ſhort of this calculation. Abdi Pacha, who governed 13 or 14 years ago, carried off, at the end of 15 months, upwards of L.160,000, by laying under contribution every trade, even the very cleaners of tobacco-pipes; and very lately another of the ſame name has been obliged to fly for ſimilar oppreſſions. The former was rewarded by the divan with the command of an army againſt the Ruſſians; but if the latter has not enriched himſelf, he will be ſtrangled as an extortioner. Such is the ordinary progreſs of affairs in Turkey!

In conſequence of ſuch wretched government, the greater part of the pachalics in the empire are impoveriſhed and laid waſte. This is the caſe in particular with that of Aleppo. In the ancient *deſtars*, or regiſters of impoſts, upwards of 3200 villages were reckoned; but at preſent the collector can ſcarcely find 400. Such of our merchants as have reſided there 20 years, have themſelves ſeen the greater part of the environs

environs of Aleppo became depopulated. The traveller meets with nothing but houses in ruins, cisterns rendered useless, and fields abandoned. Those who cultivated them are fled into the towns, where the population is absorbed, but where at least the individual conceals himself among the crowd from the rapacious hand of despotism.

ALERIA, ALALIA, or ALARIA, (anc. geog.), a town of Corsica, situated near the middle of the east side of the island, on an eminence, near the mouth of the river Rotanus mentioned by Ptolemy; built by the Phocæans (Diodorus Siculus). Afterwards Sylla led a colony thither. It is now in ruins, and called *Aleria Distrutta*.

ALES (Alexander), a celebrated divine of the confession of Augsbourg, born at Edinburgh the 23d of April 1500. He soon made a considerable progress in school-divinity, and entered the lists very early against Luther, this being then the great controversy in fashion, and the grand field wherein all authors young and old used to display their abilities. Soon after, he had a share in the dispute which Patrick Hamilton maintained against the ecclesiastics, in favour of the new faith he had imbibed at Marpurgh. He endeavoured to bring them back to the Catholic religion; but this he could not effect, and even began himself to doubt about his own religion, being much affected by the discourse of this gentleman, and still more by the constancy he showed at the stake, when David Beton archbishop of St. Andrew's caused him to be burnt. Beginning thus to waver, he was himself persecuted with so much violence, that he was obliged to retire into Germany, where he became at length a perfect convert to the Protestant religion. The change of religion which happened in England after the marriage of Henry VIII. with Anna Bullen, induced Ales to go to London in 1535. He was highly esteemed by Cranmer archbishop of Canterbury, Latimer, and Thomas Cromwel, who were at that time in high favour with the king. Upon the fall of these favourites, he was obliged to return to Germany; where the elector of Brandenburg appointed him professor of divinity at Francfort upon the Oder, in 1540. But leaving this place upon some disgust, he returned to Leipsic, where he was chosen professor of divinity, and died in March 1565. He wrote a Commentary on St. John, on the epistles to Timothy, and on the Psalms, &c.

ALESA, ALÆSA, or HALESA, (anc. geog.), a town of Sicily, on the Tuscan sea, built, according to Diodorus Siculus, by Achronides of Herbita, in the second year of the 94th Olympiad, or 403 years before Christ; situated on an eminence about a mile from the sea: now in ruins. It enjoyed immunity from taxes, under the Romans (Diodorus, Cicero). The inhabitants were called *Halesini* (Cicero, Pliny); also *Alesini*, and *Alæsini*.

ALESHAM, a small neat town in Norfolk. It is 15 miles N. of Norwich, and 121 N. E. by N. of London. E. Long. 0. 30. N. Lat. 52. 53. The town consists of about 400 pretty good houses; but the streets are narrow, though well paved.

ALESIA, (anc. geog.) called *Alexia* by Livy and others; a town of the Mandubii, a people of Celtic Gaul; situated, according to Cæsar, on a very high hill, whose foot was washed on two sides by two rivers. The town was of such antiquity, that Diodorus Siculus relates it was built by Hercules. It is supposed to be the city of *Alise*, in the duchy of Burgundy, not far from Dijon.

ALET, a town of France, in Lower Languedoc, with a bishop's see. It is remarkable for its baths, and for the grains of gold and silver found in the stream which runs from the Pyrenean mountains, at the foot of which it stands. It is seated on the river Aude, 15 miles S. of Carcassone, and 37 N. W. of Narbonne. E. Long. 2. 5. N. Lat. 42. 59.

ALETRIS, in botany, a genus of the monogynia order, belonging to the hexandria class of plants, and in the natural method ranking under the 10th order, *Coronariæ*. The characters are: The *corolla* is monopetalous, funnel shaped, hexangular, much corrugated, semiquinquefid, and persistent: The *stamina* consist of six subulated filaments, the length of the corolla, and inserted into the base of the divisions of the corolla; the antheræ are oblong and erect: The *pistillum* has an ovate germen; the stylus subulated, and the length of the stamina; the stigma is trifid: The *pericarpium* is an ovated capsule, triquetrous, pointed, and trilocular: The *seeds* are numerous. Of this genus botanical writers enumerate five.

Species. 1. The farinosa, a native of Virginia, and other parts of North America. 2. The capensis, a native of the Cape of Good-Hope. 3. The hyacinthoides, or Guinea aloe. 4. The zeylanica, or Ceylon aloe. 5. The fragrans, or tree-aloe, a native of Africa. Of these only the first is so hardy as to outlive the winter in Britain, unless placed in a stove; and even this requires to be sheltered under a frame. The flowers appear in June or July, of a whitish green colour. The third and fifth produce fine spikes of white flowers; those of the third kind appearing in July, of the fifth in March or April. By proper management the last kind becomes a stately plant, rising to the height of 12 or 14 feet; the flowers open wide in the evening, and perfume the air of the stove. These send out one or two heads, or tufts, towards their tops, which may be cut off; and after they have lain a week in the stove to heal the wounded parts, they may be planted for increase. The other species seldom or never flower in Britain, nor does their appearance otherwise merit notice.

ALETUM, or ALETA, (anc. geog.), a town of Celtic Gaul, now extinct. From its ruins arose St Malo, in Brittany, at the distance of a mile. Its ruins are called *Guich Aleth* in the British.

ALEUROMANCY, the same with what was otherwise called *alphitomantia*, and *crithomanthia*, and means an ancient kind of divination performed by means of meal or flour.

ALEXANDER THE GREAT, king of Macedonia. His father Philip laid the plan of that extensive empire, which his son afterwards executed.—Philip, having made himself master of Greece, began to cast his eyes upon Persia, with a view to retaliate upon that haughty empire the injuries of former times. It was the popular topic of the day. But this prince was cut off in the midst of his enterprise. Such, however, was the influence of Alexander in the assembly of the Grecian states, that he was created general of their combined forces in the room of his father. Having made every needful

needful preparation, at the head of a veteran army he invaded Asia. The lieutenants of Darius, who was then king of Persia, opposed him at the river Granicus, where Alexander obtained a complete victory, after which he pursued his march through Asia. At Issus, near Scanderoon, he was met by Darius in person, at the head of a prodigious army. Here he obtained a second victory; and took the camp of Darius, together with his family, whom he treated with the utmost humanity. Contrary to all the maxims of war, instead of pursuing Darius, he made an excursion into Egypt; and, as far as appears, through no better motives than those of vanity. Here he was acknowledged to be the son of Jupiter Ammon. In the mean time Darius recruited his strength, and got together an army superior to what he brought into the plain of Issus. Alexander having finished his Egyptian expedition, traversed Asia, and passed the Euphrates. At Arbella, a town in Assyria, he met Darius. Here a decisive battle was fought, which put all Persia into the hands of Alexander. His ambition not being satisfied with the conquest of that vast country, he projected an expedition into India. Here he met with great opposition from Porus, a gallant prince, whom in the end he reduced. Beyond the Ganges lay a country still unsubdued. He notified it to his army, that he proposed to pass the river. But these veterans, harassed with the fatigues, and seeing no end of their labour, mutinied, and refused to march further. The disappointed chief was therefore obliged to return. At Babylon he proposed to receive ambassadors, appoint governors, and settle his vast monarchy; but his excesses put an end to his life in the midst of his design, and in the flower of his age.

The character of this hero is so familiar to every body, that it is almost needless labour to draw it. All the world knows, says Mr. Bayle, that it was equally composed of very great virtues and very great vices. He had no mediocrity in any thing but his stature: in his other properties, whether good or bad, he was all extremes. His ambition rose even to madness. His father was not at all mistaken in supposing the bounds of Macedon too small for his son: for how could Macedon bound the ambition of a man, who reckoned the whole world too small a dominion? He wept at hearing the philosopher Anaxarchus say, that there was an infinite number of worlds: his tears were owing to his despair of conquering them all, since he had not yet been able to conquer one. Livy, in a short digression, has attempted to enquire into the events which might have happened, if Alexander, after the conquest of Asia, had brought his arms into Italy? Doubtless things might have taken a very different turn with him; and all the grand projects, which succeeded so well against an effeminate Persian monarch, might easily have miscarried if he had had to do with rough hardy Roman armies. And yet the vast aims of this mighty conqueror, if seen under another point of view, may appear to have been confined in a very narrow compass; since, as we are told, the utmost wish of that great heart, for which the whole earth was not big enough, was, after all, to be praised by the Athenians: for it is related, that the difficulties which he encountered in order to pass the Hydaspes, forced him to cry out, "O Athenians, could you believe to what dangers I "expose myself for the sake of being celebrated by "you?" But Bayle affirms, that this was quite consistent with the vast unbounded extent of his ambition, as he wanted to make all future time his own, and be an object of admiration to the latest posterity; yet did not expect this from the conquest of worlds, but from books. He was perfectly in the right, says Bayle; "for if Greece had not furnished him with good writers, he would long ago have been as much forgotten as the kings who reigned in Macedon before "Amphitryon."

Alexander has been praised upon the score of continency, yet his life could not surely be quite regular in that respect. Indeed the fire of his early youth appeared so cold towards women, that his mother suspected him to be impotent; and, to satisfy herself in this point, did, with the consent of Philip, procure a very handsome courtezan to lie with him, whose carresses, however, were all to no purpose. His behaviour afterwards to the Persian captives shows him to have had a great command over himself in this particular. The wife of Darius was a finished beauty; her daughters likewise were all beauties; yet this young prince, who had them in his power, not only bestowed on them all the honours due to their high rank, but managed their reputation with the utmost delicacy. They were kept as in a cloyster concealed from the world, and secured from the reach of every dishonourable (not only attack, but) imputation. He did not give the least handle to scandal, either by his visits, his looks, or his words: and for other Persian dames his prisoners, equally beautiful in face and shape, he contented himself with saying gaily, that they gave indeed much pain to his eyes. The amazon Thalestris could not obtain from him a compliance with her gallant request till after a delay of thirteen days. In the mean time, what are we to conclude from his causing his favourite mistress Pancaste to be drawn naked by Apelles, tho' it is true he gave her to the painter, who fell in love with her? What of that immoderate love of boys, which Athenæus relates of him? What of that prodigious number of wives and concubines which he kept?

His excesses with regard to wine were notorious, and beyond all imagination; and he committed, when drunk, a thousand extravagancies. It was owing to wine, that he killed Clytus who saved his life, and burnt Persepolis, one of the most beautiful cities of the East: he did this last indeed at the instigation of the courtezan Thaïs; but this circumstance made it only the more heinous. It is generally believed, that he died by drinking immoderately: and even Plutarch, who affects to contradict it, owns that he did nothing but drink the whole day he was taken ill.

In short, to sum up the character of this prince, we cannot be of opinion, that his good qualities did in any wise compensate for his bad ones. Heroes make a noise: their actions glare, and strike the senses forcibly; while the infinite destruction and misery they occasion lies more in the shade, and out of sight. One good legislator is worth all the heroes that ever did or will exist. See MACEDON.

ALEXANDER AB ALEXANDRO, a Neapolitan lawyer, of great learning, who flourished toward the end of the 15th and beginning of the 16th century. He followed the profession of the law first at Naples, afterwards

Alexander. afterwards at Rome: but he devoted all the time he could ſpare to the ſtudy of polite literature; and at length he entirely left the bar, that he might lead a more eaſy and agreeable life with the muſes. The particulars of his life are to be gathered from his work intitled *Genialium Dierum*: We are there informed that he lodged at Rome, in a houſe that was haunted; and he relates many ſurpriſing particulars about the ghoſt: he ſays alſo, that when he was very young, he went to the lectures of Philelphus, who explained at Rome the Tuſculan queſtions of Cicero; he was there alſo when Nicholas Perot and Domitius Calderinus read their lectures upon Martial. The particular time when he died is not known; but he was buried in the monaſtery of the Olivets. Tiraquea wrote a learned commentary upon his work, which was printed at Lyons in 1587, and reprinted at Leyden in 1673, with the notes of Dennis Godfrey, Chriſtopher Colerus, and Nicholas Mercerus.

ALEXANDER (Neckham), an eminent-Engliſh writer in the 12th and 13th centuries, born at St Albans in Hertfordſhire. In 1215 he was made abbot of Exeter, and died in 1227. He wrote ſeveral works, which were never publiſhed; but they are to be found in manuſcript in the libraries of England and other countries.

ALEXANDER (Noel), an indefatigable writer of the 17th century, born at Roan in Normandy, 1639. After finiſhing his ſtudies at Roan, he entered into the order of Dominican friars, and was profeſſed there in 1655. Soon after he went to Paris, to go through a courſe of philoſophy and divinity in the great convent, where he diſtinguiſhed himſelf ſo, that he was appointed to teach philoſophy there, which he did for 12 years. Mr Colbert ſhowed him many marks of his eſteem: and being determined to omit nothing to perfect the education of his ſon, afterwards archbiſhop of Roan, he formed an aſſembly of the moſt learned perſons, whoſe conferences upon eccleſiaſtical hiſtory might be of advantage to him. Father Alexander was invited to this aſſembly, where he exerted himſelf with ſo much genius and ability, that he gained the particular friendſhip of young Colbert, who ſhowed him the utmoſt regard as long as he lived. Theſe conferences gave riſe to Alexander's deſign of writing an eccleſiaſtical hiſtory: for, being deſired to reduce what was material in theſe conferences to writing, he did it with ſo much accuracy, that the learned men who compoſed this aſſembly, adviſed him to undertake a complete body of church-hiſtory. This he executed with great aſſiduity, collecting and digeſting the materials himſelf, and writing even the tables with his own hand. He at laſt completed his work in 1686. Towards the latter part of his life, he was afflicted with the loſs of his ſight; a moſt inexpreſſible misfortune to one whoſe whole pleaſure was in ſtudy, yet he bore it with great patience and reſignation. He died merely of a decay of nature, 1724, in the 86th year of his age.

ALEXANDER SEVERUS, emperor of Rome, ſucceeded Heliogabalus about A. D. 222, when but 16 years of age. His mother's name was Mammæa, and by her advice he in a great meaſure regulated his conduct. He applied himſelf to the reformation of abuſes, the ſtate having been greatly diſordered by the vicious conduct of his predeceſſor; he was a moſt ſtrict lover of juſtice, an encourager of learning and learned men, and favourable to the Chriſtians. He made a ſucceſsful expedition againſt the Perſians; but endeavouring to reform his troops, which had grown very licentious under the late bad government, they murdered him at the inſtigation of Maximinus in the 29th year of his age, together with his mother, A. D. 235.

ALEXANDER VI. (Pope), had four baſtards when he was cardinal, for one of which he had ſo great affection, that he ſtuck at nothing to raiſe him. Deſigning to poiſon ſome cardinals, he was poiſoned himſelf, A. D. 1503. See BORGIA.

ALEXANDER VII. (Pope). See CHIGI.

ALEXANDER Biſhop of Lincoln in the reigns of Henry I. and Stephen, was a Norman by birth, and nephew of the famous Roger, biſhop of Saliſbury, who firſt made him archdeacon of Saliſbury, and afterwards, by his intereſt with the king, raiſed him to the mitre. Alexander was conſecrated at Canterbury, July 22. 1123. Having received his education under his uncle, the biſhop of Saliſbury, and been accuſtomed to a ſplendid way of living, he affected ſhow and ſtate more than was ſuitable to his character, or conſiſtent with his fortunes. This failing excepted, he was a man of worth and honour, and every way qualified for his ſtation. The year after his conſecration, his cathedral church at Lincoln having been accidentally burnt down, he rebuilt it, and ſecured it againſt the like accident for the future by a ſtone roof. This prelate increaſed the number of prebends in his church, and augmented its revenues with ſeveral manors and eſtates. In imitation of the barons and ſome of the biſhops, particularly his uncle the biſhop of Saliſbury, he built three caſtles; one at Banbury, another at Sleaford, and a third at Newark. He likewiſe founded two monaſteries; one at Haverholm, for regular canons and nuns together, the other at Tame for white-friars. He went twice to Rome in the years 1142 and 1144. The firſt time, he came back in quality of the pope's legate, for the calling a ſynod, in which he publiſhed ſeveral wholeſome and neceſſary canons. In Auguſt 1147, he took a third journey to the pope, who was then in France; where he fell ſick through the exceſſive heat of the weather, and returning with great difficulty to England, he died in the 24 year of his prelacy.

ALEXANDER (William), earl of Stirling, an eminent Scots ſtateſman and poet in the reigns of James VI. and Charles I. who, after travelling with the duke of Argyle as his tutor or companion, wrote a poetical complaint of his unſucceſsful love of ſome beauty, under the title of *Aurora*. He then removed to the court of James VI. where he applied to the more ſolid parts of poetry, forming himſelf upon the plan of the Greek and Roman tragedians. In 1607, he publiſhed ſome dramatic performances, intitled *The Monarchic Tragedies*, dedicated to king James; who was ſo well pleaſed with them, as to call him his philoſophical poet. After this, he is ſaid to have written *A ſupplement* to complete the third part of Sir Philip Sidney's Arcadia; and in 1613, he produced a poem called *Doomſday, or the Great Day of Judgment*. He was made gentleman-uſher to prince Charles, and maſter of the requeſts; was knighted; and obtained a grant of Nova Scotia, where he projected the ſettlement of a colony, but afterward ſold it to the French. In 1626, he was made ſecretary of ſtate for

 Scotland;

Scotland; was created first viscount, and then earl, of Stirling; and died in 1640.

ALEXANDER I. (St), whom St Ireneus reckons the fifth bishop of Rome, succeeded St Evaristus in the year 109, and died in the year 119. There is no account of his life; and the epistles which are attributed to him are supposititious.

ALEXANDER II. king of Scotland, succeeded his father William in 1213, at 16 years of age. He made an expedition into England, to oppose the tyranny of king John; who returned the visit, and was offered battle by Alexander, but refused it. He took the city of Carlisle from Henry III. which was afterwards exchanged for Berwick. Alexander died in 1249, in the 51st year of his age, and 35th of his reign; and left for his successor, his son——

ALEXANDER III. who was crowned king of Scotland in 1249. The Cummings, lords of Scotland, took arms against him; and taking him prisoner, confined him at Striveling: but he was afterwards released by his subjects. He married the daughter of Henry III. king of England; and was at length killed by a fall from his horse, on the 10th of April 1290, after having reigned 42, or according to others 37, years.

ALEXANDERS, in botany. See SMYRNIUM.

ALEXANDREA, (anc. geog.) a mountain of Mysia, on the sea-coast, forming a part of mount Ida, where Paris gave judgment on the three goddesses.

ALEXANDRETTA, by the Turks called *Scanderoon*; a town in Syria, at the extremity of the Mediterranean sea. It is the port of Aleppo, from which it is distant 28 or 30 leagues. It is now, properly speaking, nothing else but a village, without walls, in which the tombs are more numerous than the houses, and which entirely owes its existence to the road which it commands. This is the only road, in all Syria, where vessels anchor on a solid bottom, without their cables being liable to chafe: but in other respects it has many inconveniences. It is infested, during winter, by a peculiar wind, called by the French sailors *le Raguier*, which rushing from the snowy summits of the mountains, frequently forces ships to drag their anchors several leagues: And when the snow begins to cover the mountains which surround the Gulph, tempestuous winds arise which prevent vessels from entering for three or four months together. The road also to Aleppo by the plain is infested by Curd robbers, who conceal themselves in the neighbouring rocks, and frequently attack and plunder the strongest caravans. But the worst circumstance is the extreme unwholesomeness of the air, occasioned here by stagnant waters and mephitic exhalations. It may be affirmed, that this every year carries off one-third of the crews of the vessels which remain here during the summer; nay, ships frequently lose all their men in two months. The season for this epidemic disorder is principally from May to the end of September: it is an intermitting fever of the most malignant kind; and is accompanied with obstructions of the liver, which terminate in a dropsy. To this baneful epidemic, Alexandretta, from its situation, seems to be irremediably condemned: for the plain on which the town is built is so low and flat, that the rivulets, finding no declivity, can never reach the sea. When they are swelled by the winter rains, the sea, swelled likewise by tempests, hinders their discharging themselves into it: hence their waters, forced to spread themselves, form lakes in the plain. On the approach of the summer, the waters becoming corrupted by the heat, exhale vapours equally corrupt, and which cannot disperse, being confined by the mountains that encircle the gulph. The entrance of the bay besides lies to the west, which in those countries is the most unhealthy exposure when it corresponds with the sea. The labour necessary to remedy this would be immense, and after all insufficient; and, indeed, such an undertaking would be absolutely impossible under a government like that of the Turks. A few years ago, Mr Volney informs us, the merchants of Aleppo, disgusted with the numerous inconveniences of Alexandretta, wished to abandon that port and carry the trade to Latakia. They proposed to the Pacha of Tripoli to repair the harbour at their own expence, provided he would grant them an exemption from all duties for ten years. To induce him to comply with their request, the agent they employed talked much of the advantage which would, *in time*, result to the whole country: "But what signifies it to me what may happen *in time*, replied the Pacha? I was yesterday at Marach; tomorrow, perhaps I shall be at Djedda: Why should I deprive myself of present advantages, which are certain, for future benefits I cannot hope to partake?" The European factors were obliged therefore to remain at Scandaroon. There are three of these factors, two for the French, and one for the English and Venetians. The only curiosity which they have to amuse strangers with consists in six or seven marble monuments, sent from England, on which you read: *Here lies such a one carried off in the flower of his age, by the fatal effects of a contagious air.* The sight of these is the more distressing, as the languid air, yellow complection, livid eyes, and dropsical bellies of those who show them, make it but too probable they cannot long escape the same fate. It is true, they have some resource in the village of Bailan, the pure air and excellent waters of which surprisingly restore the sick. The aga, for some years past, has applied the duties of the customhouse of Alexandretta to his own use, and rendered himself almost independent of the Pacha of Aleppo. The Turkish empire is full of such rebels, who frequently die in peaceable possession of their usurpations.

ALEXANDRIA, now *Scanderia*, by Athenæus called Χρυση; a city of Lower Egypt, and for a long time its capital. This city was built by Alexander the Great, soon after the overthrow of Tyre, about 333 years before Christ. It is situated on the Mediterranean, twelve miles west of that mouth of the Nile anciently called *Canopicum*; and lies in E. Long. 30. 19. N. Lat. 31. 10.

Alexander is said to have been induced to build this city, on account of its being conveniently situated for a fine port; and so sudden was his resolution, that after he had directed where every public structure was to be placed, fixed the number of temples, and the deities to whom they should be dedicated, &c. there were no instruments at hand proper for marking out the walls, according to the custom of those times. Upon this, a workman advised the king to collect what meal was among the soldiers, and to sift it in lines upon the ground, whereby the circuit of the walls would be sufficiently marked out. This advice was followed; an

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and the new method of marking out the walls was, by Ariſtander, the king's foothſayer, interpreted as a preſage of the city's abounding with all the neceſſaries of life. Nor was he deceived in his prediction; for Alexandria ſoon became the ſtaple not only for merchandiſe, but alſo for all the arts and ſciences of the Greeks.

Alexandria was a league and a half long, by one-third in breadth, which made the circumference of its walls about four leagues. Lake Mareotis bathed its walls on the ſouth, and the Mediterranean on the north. It was interſected lengthwiſe by ſtraight parallel ſtreets. This direction left a free paſſage to the northerly wind, which alone conveys coolneſs and ſalubrity into Egypt. A ſtreet of 2000 feet wide began at the gate of the ſea, and terminated at the gate of Canopus. It was decorated by magnificent houſes, by temples, and by public buildings. In this extenſive range, the eye was never tired with admiring the marble the porphyry, and the obeliſks, which were deſtined at ſome future day to embelliſh Rome and Conſtantinople. This ſtreet, the handſomeſt in the univerſe, was interſected by another of the ſame breadth, which formed a ſquare at their junction of half a league in circumference. From the middle of this great place, the two gates were to be ſeen at once, and veſſels arriving under full ſail from the north and from the ſouth.

A mole of a mile in length ſtretched from the continent to the iſle of Pharos, and divided the great harbour into two. That which is to the northward preſerved its name. A dyke drawn from the iſland to the rock whereon was built the Pharos, ſecured it from the weſterly winds. The other was called *Eunoſtus*, or the Safe return. The former is called at preſent the new, the latter the old harbour: a bridge that joins the mole to the city, ſerved for a communication between them. It was raiſed on lofty pillars ſunk into the ſea, and left a free paſſage for ſhips. The palace, which advanced beyond the promontory of *Lochias*, extended as far as the dyke, and occupied more than a quarter of the city. Each of the Ptolemies added to its magnificence. It contained within its incloſure, the muſeum, an aſylum for learned men, groves and buildings worthy of royal majeſty, and a temple where the body of Alexander was depoſited in a golden coffin. The infamous Seleucus Cibyoſactes violated this monument, carried off the golden coffin, and put a glaſs one in its place. In the great harbour was the little iſland of Anti-Rhodes, where ſtood a theatre, and a royal place of reſidence. Within the harbour of Eunoſtos was a ſmaller one, called Kibotos, dug by the hand of man, which communicated with Lake Mareotis by a canal. Between this canal and the palace was the admirable temple of Serapis, and that of Neptune near the great place where the market was held. Alexandria extended likewiſe along the ſouthern banks of the lake. Its eaſtern part preſented to view the gymnaſium, with its porticoes of more than 600 feet long, ſupported by ſeveral rows of marble pillars. Without the gate of Canopus was a ſpacious circus for the chariot races. Beyond that, the ſuburb of Nicopolis ran along the ſea-ſhore, and ſeemed a ſecond Alexandria. A ſuperb amphitheatre was built there with a race-ground, for the celebration of the quinquennalia.

Such is the deſcription left us of Alexandria by the ancients, and above all by Strabo.

The architect employed by Alexander in this undertaking was the celebrated Dinocrates, who had acquired ſo much reputation by rebuilding the temple of Diana at Epheſus. The city was firſt rendered populous by Ptolemy Soter, one of Alexander's captains, who, after the death of the Macedonian monarch, being appointed governor of Egypt, ſoon aſſumed the title of king, and took up his reſidence at Alexandria, about 304 years before Chriſt.

In the 30th year of Ptolemy Soter's reign, he took his ſon Ptolemy Philadelphus partner with him in the empire; and by this prince the city of Alexandria was much embelliſhed. In the firſt year of his reign the famous watch-tower of Pharos was finiſhed. It had been begun ſeveral years before by Ptolemy Soter; and, when finiſhed, was looked upon as one of the wonders of the world. The ſame year, the iſland of Pharos itſelf, originally ſeven furlongs diſtant from the continent, was joined to it by a cauſeway. This was the work of Dexiphanes, who completed it at the ſame time that his ſon put the laſt hand to the tower. The tower was a large ſquare ſtructure of white marble; on the top of which fires were kept conſtantly burning, for the direction of ſailors. The building coſt 800 talents; which, if Attic, amounted to L. 165,000 ſterl., if Alexandrian, to twice that ſum.

The architect employed in this famous ſtructure fell upon the following contrivance to uſurp the whole glory to himſelf.—Being ordered to engrave upon it the following inſcription, "King Ptolemy to the Gods the Saviours, for the benefit of Sailors;" inſtead of the king's name he ſubſtituted his own, and then filling up the hollow of the marble with mortar, wrote upon it the abovementioned inſcription. In proceſs of time, the mortar being wore off, the following inſcription appeared: "Sostratus the Cnidian, the ſon of Dexiphanes, to the Gods the Saviours, for the benefit of Sailors."

This year alſo was remarkable for the bringing of the image of Serapis from Pontus to Alexandria. It was ſet up in one of the ſuburbs of the city called *Rhacotis*, where a temple was afterwards erected to his honour, ſuitable to the greatneſs of that ſtately metropolis, and called, from the god worſhipped there, *Serapeum*. This ſtructure, according to Ammianus Marcellinus, ſurpaſſed in beauty and magnificence all others in the world, except the capitol at Rome.——Within the verge of this temple was the famous Alexandrian library. It was founded by Ptolemy Soter, for the uſe of an academy he inſtituted in this city; and, by continual additions by his ſucceſſors, became at laſt the fineſt library in the world, containing no fewer than 700,000 volumes. The method followed in collecting books for this library, was, to ſeize all thoſe which were brought into Egypt by Greeks or other foreigners. The books were tranſcribed in the muſeum by perſons appointed for that purpoſe; the copies were then delivered to the proprietors, and the originals laid up in the library. Ptolemy Euergetes, having borrowed from the Athenians the works of Sophocles, Euripides, and Æſchylus, returned them only the copies, which he cauſed to be tranſcribed in as beautiful a manner as poſſible; preſenting the Athenians at the ſame time with fifteen talents (upwards of L. 3000 Sterling) for the exchange.

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As the museum was at first in that quarter of the city called *Bruchion*, near the royal palace, the library was placed there likewise; but when it came to contain 400,000 volumes, another library, within the Serapeum, was erected by way of supplement to it, and on that account called the *daughter* of the former. In this second library 300,000 volumes, in process of time, were deposited; and the two together contained the 700,000 volumes already mentioned. In the war carried on by Julius Cæsar against the inhabitants of this city, the library in the Bruchion, with the 400,000 volumes it contained, was reduced to ashes. The library in the Serapeum, however, still remained: and here Cleopatra deposited 200,000 volumes of the Pergamean library, which Marc Antony presented her with. These, and others added from time to time, rendered the new library at Alexandria more numerous and considerable than the former; and though it was often plundered during the revolutions and troubles of the Roman empire, yet it was again and again repaired, and filled with the same number of books.

For 293 years Alexandria was held in subjection by the Ptolemies. Here is a list of these princes, with the dates of their respective reigns.

Ptolemy the son of Lagus, surnamed *Soter*, reigned 39 years, and died in the year of the world 3720. Ptolemy Philadelphus reigned 39 years, and died in 3758. Ptolemy Euergetes reigned 25 years, and died in 3783. Ptolemy Philopater reigned 17 years, and died in 3800. Ptolemy Epiphanes reigned 24 years, and died in 3824. Ptolemy Philometer reigned 37 years, and died in 3861. Ptolemy Euergetes, or Physcon, reigned 53 years, part with his brother Philometer and part alone. He died in 3888. Ptolemy Lathyrus reigned 36 years six months. He died in 3923. Cleopatra, the daughter of Lathyrus and wife of Alexander I. reigned six months. Alexander I. the nephew of Lathyrus, was established in 3924 and died in 3943. Alexander II. the son of Alexander I. was dispossessed by the Alexandrians in 3939. Ptolemy Nothus, or Auletes, the son of Lathyrus, reigned 13 years, and died in 3953. Ptolemy, surnamed *Dionysius* or *Bacchus*, reigned three years eight months, and died in 3957. Cleopatra reigned from 3957, and killed herself in 3974.

This city, as we have already observed, soon became extremely populous, and was embellished both by its own princes and the Romans; but, like most other noted cities of antiquity, hath been the seat of terrible massacres. About 141 years before Christ, it was almost totally depopulated by Ptolemy Physcon. That barbarous monster, without the least provocation, gave free liberty to his guards to plunder his metropolis and murder the inhabitants at their pleasure. The cruelties practised on this occasion cannot be expressed; and the few who escaped were so terrified that they fled into other countries. Upon this, Physcon, that he might not reign over empty houses, invited thither strangers from the neighbouring countries; by whom the city was repeopled, and soon recovered its former splendor. On this occasion many learned men having been obliged to fly, proved the means of reviving learning in Greece, Asia Minor, the islands of the Archipelago, and other places, where it was almost totally lost.

Alexandria

The new inhabitants were not treated with much more kindness by Physcon than the old ones had been; for, on their complaining of his tyrannical behaviour, he resolved on a general massacre of the young men. Accordingly, when they were one day assembled in the gymnasium, or place of their public exercises, he ordered it to be set on fire; so that they all perished, either in the flames, or by the swords of his mercenaries, whom the tyrant had placed at all the avenues.

Though Julis Cæsar was obliged to carry on a war for some time against the city, it seems not to have suffered much damage, except the burning of the library already mentioned. Before Cæsar left Alexandria, in acknowledgment of the assistance he had received from the Jews, he confirmed all their privileges there, and even engraved his decree on a pillar of brass. This, however, did not prevent the massacre of 50,000 of them in this city about the year of Christ 67.

The city of Alexandria seems to have fallen into decay soon after this, and to have forfeited many of its ancient privileges, tho' for what offence is not known; but when Adrian visited Egypt, about the year 141, it was almost totally ruined. He repaired both the public and private buildings, not only restoring the inhabitants to their ancient privileges, but heaping new favours upon them; for which they returned him their solemn thanks, and conferred upon him what honours they could while he was present; but as soon as he was gone, they published the most bitter and virulent lampoons against him.

The fickle and satirical humour of the Alexandrians was highly disliked by Adrian, though he inflicted no punishment upon them for it; but when they lampooned Caracalla, he did not let them escape so easily. That tyrant, in the year 215, when he visited their city, having become the subject of their foolish satires, ordered a general massacre by his numerous troops, who were dispersed all over the city. The inhuman orders being given, all were murdered, without distinction of age or sex; so that in one night's time the whole city floated in blood, and every house was filled with carcases. The monster who occasioned this had retired during the night to the temple of Serapis, to implore the protection of that deity; and, not yet satiated with slaughter, commanded the massacre to be continued all the next day; so that very few of the inhabitants remained. As if even this had not been sufficient, he stripped the city of all its ancient privileges; suppressed the academy; ordered all strangers who lived there to depart; and that the few who remained might not have the satisfaction of seeing one another, he cut off all communication of one street with another, by walls built for that purpose, and guarded by troops left there.

Notwithstanding this terrible disaster, Alexandria soon recovered its former splendor, as Caracalla was murdered a short time after. It was long esteemed the first city in the world, next to Rome; and we may judge of its magnificence, and the multitude of people contained in it, from the account of Diodorus Siculus, who relates, that in his time (44 years before Christ) Alexandria had on its rolls 300,000 freemen. Towards the middle of the sixth century, Amrou *Ebn el Aas*, Omar's general, took it by storm, after a siege

of

Alexandria of 14 months, and with the loss of 23,000 men. Heraclius, the emperor of Constantinople, did not send a single ship to its assistance. This prince affords an example very rare in history; he had displayed some vigour in the first year of his reign, and then suffered himself to be lulled into idleness and effeminacy. Awakened suddenly from his lethargy by the noise of the conquests of Cosroes, that scourge of the east, he put himself at the head of his armies, distinguished himself as a great captain from his very first campaign, laid waste Persia for seven years, and returned to his capital covered with laurels: he then became a theologian on the throne, lost all his energy, and amused himself the rest of his life with disputing upon Monotheism, whilst the Arabs were robbing him of the finest provinces of his empire. Deaf to the cries of the unfortunate inhabitants of Alexandria, as he had been to those of the people of Jerusalem, who defended themselves for two years, he left them a sacrifice to the fortunate ascendancy of the indefatigable Amrou. All their intrepid youth perished with their arms in their hands.

The victor, astonished at his conquest, wrote to the caliph, "I have taken the city of the west. It is of an immense extent. I cannot describe to you how many wonders it contains. There are 4000 palaces, 4000 baths, 12,000 dealers in fresh oil, 12,000 gardeners, 40,000 Jews who pay tribute, 400 comedians," &c.

At this time according to the Arabian historians, Alexandria consisted of three cities, *viz. Menna*, or the port, which included Pharos, and the neighbouring parts; *Alexandria*, properly so called, where the modern Scanderia now stands; and *Nekita*, probably the Necropolis of Josephus and Strabo.

At that time John, surnamed *the grammarian*, a famous Peripatetic philosopher, being in the city, and in high favour with Amrou Ebn al Aas the Saracen general begged of him the royal library. Amrou replied, that it was not in his power to grant such a request; but that he would write to the khalif on that head; since without knowing his pleasure, he dared not to dispose of a single book. He accordingly wrote to Omar, who was then khalif, acquainting him with the request of his friend: To which the ignorant tyrant replied, That if those books contained the same doctrine with the koran, they could be of no use, since the koran contained all necessary truths; but if they contained any thing contrary to that book, they ought not to be suffered: and therefore, whatever their contents were, he ordered them to be destroyed. Pursuant to this order, they were distributed among the public baths; where, for the space of six months, they served to supply the fires of those places of which there was an incredible number in Alexandria.

After the city was taken, Amrou thought proper to pursue the Greeks who had fled farther up the country; and therefore marched out of Alexandria, leaving but a very slender garrison in the place. The Greeks, who had before fled on board their ships, being apprised of this, returned on a sudden, surprised the town, and put all the Arabs they found therein to the sword: but Amrou, receiving advice of what had happened, suddenly returned, and drove them out of it with great slaughter; after which the Greeks were so intimidated, that he had nothing farther to fear from them.—A few years after, however, Amrou being deprived of his government by the khalif Othman, the Egyptians were so much displeased with his dismission that they inclined to a revolt; and Constantine the Greek emperor, having received intelligence of their disaffection, began to meditate the reduction of Alexandria. For this purpose, he sent one Manuel, an eunuch, and his general, with a powerful army, to retake that place; which, by the assistance of the Greeks in this city, who kept a secret correspondence with the imperial forces while at sea, and joined them as soon as they had made a descent, he effected, without any considerable effusion of Christian blood. The khalif, now perceiving his mistake, immediately restored Amrou to his former dignity. This step was very agreeable to the natives; who having had experience of the military skill and bravery of this renowned general, and apprehending that they should be called to an account by the Greeks for their former perfidious conduct, had petitioned Othman to send him again into Egypt.—Upon Amrou's arrival, therefore, at Alexandria, the Copts or natives, with the traitor Al-Mokawkas (who had formerly betrayed to Amrou the fortress of Mesr) at their head, not only joined him, but supplied him with all kinds of provisions, exciting him to attack the Greeks without delay. This he did; and, after a most obstinate dispute which lasted several days, drove them into the town, where, for some time, they defended themselves with great bravery, and repelled the utmost efforts of the besiegers. This so exasperated Amrou, that he swore, "If God enabled him to conquer the Greeks, he would throw down the walls of the city, and make it as easy of access as a *bawdy-house*, which lies open to every body." Nor did he fail to execute this menace; for having taken the town by storm, he quite dismantled it, entirely demolishing the walls and fortifications. The lives of the citizens, however, were spared, at least as far as lay in the general's power; but many of them were put to the sword by the soldiers on their first entrance. In one quarter particularly, Amrou found them butchering the Alexandrians with unrelenting barbarity; to which, however, by his seasonable interposition, he put a stop, and on that spot erected a mosque, which he called the *mosque of mercy*.

From this time Alexandria never recovered its former splendor. It continued under the dominion of the khalifs till the year 924, when it was taken by the Magrebians, two years after its great church had been destroyed by fire. This church was called by the Arabs *Al Kaisaria*, or *Cæsarea*; and had formerly been a pagan temple, erected in honour of Saturn by the famous queen Cleopatra.

The city was soon after abandoned by the Magrebians; but in 928 they again made themselves masters of it: their fleet being afterwards defeated by that belonging to the khalif, *Abul Kasem* the Magrebian general retired from Alexandria, leaving there only a garrison of 300 men; of which *Thmall*, the khalif's admiral, being apprised, he in a few days appeared before the town, and carried off the remainder of the inhabitants to an island in the Nile called *Abukair*. This was done, to prevent Abul Kâsem from meeting with any entertainment at Alexandria, in case he should think proper to return. According to Eutychius, above Alexandria.

200,000

Alexandria. 200,000 of the miserable inhabitants perished this year.

What contributed to raise Alexandria to such a prodigious height of splendor as it enjoyed for a long time, was its being the centre of commerce between the eastern and western parts of the world. It was with the view of becoming master of this lucrative trade, that Alexander built this city, after having extirpated the Tyrians, who formerly engrossed all the East-India traffic. Of the immense riches which that trade afforded, we may form an idea, from considering that the Romans accounted it a point of policy to oppress the Egyptians, especially the Alexandrians; and after the defeat of Zenobia, there was a single merchant of Alexandria who undertook to raise and pay an army out of the profits of his trade. The Greek emperors drew prodigious tributes from Egypt, and yet the khalifs found their subjects in so good circumstances as to screw up their revenues to three hundred millions of crowns.

Though the revolutions which happened in the government of Egypt, after it fell into the hands of the Mahometans, frequently affected this city to a very great degree; yet still the excellence of its port, and the innumerable conveniences resulting from the East-India trade, to whomsoever were masters of Egypt, preserved Alexandria from total destruction, even when in the hands of the most barbarous nations. Thus, in the 13th century, when the barbarism introduced by the Goths, &c. began to wear off from the European nations, and they acquired a taste for the elegancies of life, the old mart of Alexandria began to revive; and the port, though far from recovering its former magnificence, grew once more famous by becoming the centre of commerce: but having fallen under the dominion of the Turks, and the passage round the Cape of Good Hope being discovered by the Portuguese in 1499, a fatal blow was given to the Alexandrian commerce, and the city has since fallen into decay.

At present the city of Alexandria is reckoned to have about 14,000 or 15,000 inhabitants; a strange colluvies of different nations, as well as from various parts of the Turkish empire. They are in general given to thieving and cheating; and (like their predecessors) seditious above all others, were they not kept in awe by the severity of their government. The British and French carry on a considerable commerce with them, and have each a consul residing here. Some Venetian ships also sail thither yearly, but with French colours, and under the protection of France. The subjects of those kingdoms which keep no consul here, are subjected to a tax by the Grand Signior: but the Jews have found out the method of indemnifying themselves for this disadvantage; namely, by selling their commodities cheaper than other foreigners can afford. They are also favoured by the farmers of the revenue; who know, that if they do not pay some private regard to them, the Jews have it their power to cause fewer merchandizes come into their port during the two years that their farm lasts.

The present city is a kind of peninsula situated between the two ports. That of the westward was called by the ancients the *Portus Eunostus*, now the *Old Port*, and is by far the best; Turkish vessels only are allowed to anchor there: the other, called the *New Port*, is for the Christians; at the extremity of one of the arms of which stood the famous Pharos. The New Port, the only harbour for the Europeans, is clogged up with sand, insomuch that in stormy weather ships are liable to bilge; and the bottom being also rocky, the cables soon chafe and part; so that one vessel driving against a second, and that against a third, they are perhaps all lost. Of this there was a fatal instance 16 or 18 years ago, when 42 vessels were dashed to pieces on the mole in a gale of wind from the north-west, and numbers have been since lost there at different times. If it be asked, Why do they not repair the New Port? the answer is, That in Turkey they destroy every thing and repair nothing. The old harbour will be destroyed likewise, as the ballast of vessels has been continually thrown into it for the last 200 years. The spirit of the Turkish government is to ruin the labours of past ages, and destroy the hopes of future times, because the barbarity of ignorant despotism never considers to-morrow.

In time of war, Alexandria is of no importance: no fortification is to be seen; even the Farillon, with its lofty towers, cannot be defended. It has not four cannon fit for service, nor a gunner who knows how to point them. The 500 janissaries, who should form the garrison, reduced to half the number, know nothing but how to smoke a pipe. But Alexandria is a place of which the conquest would be of no value. A foreign power could not maintain itself there, as the country is without water. This must be brought from the Nile by the kalidj, or canal of 12 leagues, which conveys it thither every year at the time of the inundation. It fills the vaults or reservoirs dug under the ancient city, and this provision must serve till the next year. It is evident, therefore, that were a foreign power to take possession, the canal would be shut, and all supplies of water cut off. It is this canal alone which connects Alexandria with Egypt; for from its situation without the Delta, and the nature of the soil, it really belongs to the desarts of Africa. Its environs are sandy, flat, and sterile, without trees and without houses; where we meet with nothing but the plant which yields the kali, and a row of palm-trees which follows the course of the kalidj or canal.

The city is governed like others in the same kingdom. (See EGYPT.) It hath a small garrison of soldiers, part of which are Janissaries and Assaffs; who are very haughty and insolent, not only to strangers, but to the mercantile and industrious part of the people, tho' ever so considerable and useful. The government is so remiss in favour of these wretches, that Mr Norden informs us, one of them did not hesitate to kill a farmer of the customs, for refusing to take less of him than the duty imposed, and went off unpunished; it being a common salvo among them, that what is done cannot be undone.

The present condition of Alexandria is very despicable, being now so far ruined, that the rubbish in many places overtops the houses. The famous tower of Pharos has long since been demolished, and a castle, called *Farillon*, built in its place. The causeway which joined the island to the continent is broken down, and its place supplied by a stone bridge of several arches.

Some parts of the old walls of the city are yet standing, and present us with a master-piece of ancient masonry. They are flanked with large towers, about 200 paces distant from each other, with small ones in the middle.

Alexandria. middle. Below are magnificent caſements, which may ſerve for galleries to walk in. In the lower part of the towers is a large ſquare hall, whoſe roof is ſupported by thick columns of Thebaic ſtone. Above this are ſeveral rooms, over which there are platforms more than 20 paces ſquare. The ancient reſervoirs, vaulted with ſo much art, which extend under the whole town, are almoſt entire at the end of 2000 years.

Of Cæſar's palace there remain only a few porphyry pillars, and the front, which is almoſt entire, and looks very beautiful. The palace of Cleopatra was built upon the walls facing the port, having a gallery on the outſide, ſupported by ſeveral fine columns. Not far from this palace are two obeliſks vulgarly called *Cleopatra's Needles*. They are of Thebaic ſtone, and covered with hycroglyphics. One is overturned, broken, and lying under the ſand; the other is on its pedeſtal. Theſe two obeliſks, each of them of a ſingle ſtone, are about 60 feet high, by ſeven feet ſquare at the baſe. Towards the gate of Roſetta, are five columns of marble on the place formerly occupied by the porticoes of the Gymnaſium. The reſt of the colonnade, the deſign of which was diſcoverable 100 years ago by Maillet, has ſince been deſtroyed by the barbariſm of the Turks.

But what moſt engages the attention of travellers is the Pillar of Pompey, as it is commonly called, ſituated at a quarter of a league from the ſouthern gate. It is compoſed of red granite. The capital is Corinthian, with palm leaves, and not indented. It is nine feet high. The ſhaft and the upper member of the baſe are of one piece of 90 feet long, and 9 in diameter. The baſe is a ſquare of about 15 feet on each ſide. This block of marble, 60 feet in circumference, reſts on two layers of ſtone bound together with lead; which, however, has not prevented the Arabs from forcing our ſeveral of them, to ſearch for an imaginary treaſure. The whole column is 144 feet high. It is perfectly well poliſhed, and only a little ſhivered on the eaſtern ſide. Nothing can equal the majeſty of this monument; ſeen from a diſtance, it overtops the town, and ſerves as a ſignal for veſſels. Approaching it nearer, it produces an aſtoniſhment mixed with awe. One can never be tired with admiring the beauty of the capital, the length of the ſhaft, nor the extraordinary ſimplicity of the pedeſtal. This laſt has been ſomewhat damaged by the inſtruments of travellers, who are curious to poſſeſs a relict of this antiquity; and one of the volutes of the column was immaturely brought down about twelve years ago, by a prank of ſome Engliſh captains, which is thus related by Mr Irwin.

Theſe jolly ſons of Neptune had been puſhing about the can on board one of the ſhips in the harbour, until a ſtrange freak entered into one of their brains. The eccentricity of the thought occaſioned it immediately to be adopted; and its apparent impoſſibility was but a ſpur for the putting it into execution. The boat was ordered; and with proper implements for the attempt, theſe enterpriſing heroes puſhed aſhore, to drink a bowl of punch on the top of Pompey's pillar! At the ſpot they arrived; and many contrivances were propoſed to accompliſh the deſired point. But their labour was vain; and they began to deſpair of ſucceſs, when the genius who ſtruck out the frolic happily ſuggeſted the means of performing it. A man was diſpatched to the city for a paper kite. The inhabitants were by this time appriſed of what was going forward, and flocked in crowds to be witneſſes of the addreſs and boldneſs of the Engliſh. The governor of Alexandria was told that theſe ſeamen were about to pull down Pompey's pillar. But whether he gave them credit for their reſpect to the Roman warrior, or to the Turkiſh government, he left them to themſelves; and politely anſwered, that the Engliſh were too great patriots to injure the remains of Pompey. He knew little, however, of the diſpoſition of the people who were engaged in this undertaking. Had the Turkiſh empire roſe in oppoſition, it would not perhaps at that moment have deterred them. The kite was brought, and flown ſo directly over the pillar, that when it fell on the other ſide, the ſtring lodged upon the capital. The chief obſtacle was now overcome. A two-inch rope was tied to one end of the ſtring, and drawn over the pillar by the end to which the kite was affixed. By this rope one of the ſeamen aſcended to the top; and in leſs than an hour, a kind of ſhroud was conſtructed, by which the whole company went up, and drank their punch amid the ſhouts of the aſtoniſhed multitude. To the eye below, the capital of the pillar does not appear capable of holding more than one man upon it; but our ſeamen found it could contain no leſs than eight perſons very conveniently. It is aſtoniſhing that no accident befel theſe madcaps, in a ſituation ſo elevated, that would have turned a landman giddy in his ſober ſenſes. The only detriment which the pillar received, was the loſs of the volute beforementioned; which came down with a thundering ſound, and was carried to England by one of the captains, as a preſent to a lady who commiſſioned him for a piece of the pillar. The diſcovery which they made amply compenſated for this miſchief; as without their evidence, the world would not have known at this hour, that there was originally a ſtatue on this pillar, one foot and ancle of which are ſtill remaining. The ſtatue muſt have been of gigantic ſize, to have appeared of a man's proportion at ſo great an height.

Voyage and Route, p. 370.

There are circumſtances in this ſtory which might give it an air of fiction, were it not demonſtrated beyond all doubt. Beſides the teſtimonies of many eyewitneſſes, the adventurers themſelves have left us a token of the fact, by the initials of their names, which are very legible in black paint juſt beneath the capital.

Learned men and travellers have made many fruitleſs attempts to diſcover in honour of what prince it was erected. The beſt informed have concluded, that it could not be in honour of Pompey, ſince neither Strabo nor Diodorus Siculus have ſpoken of it. The Arabian Abulfeda, in his deſcription of Egypt, calls it *the Pillar of Severus*. And hiſtory informs us †, that this emperor "viſited the city of Alexandria: That he granted a ſenate to its inhabitants, who until that time, under the ſubjection of a ſingle Roman magiſtrate, had lived without any national council, as under the reign of the Ptolemies, when the will of the prince was their only law: That he did not confine his benefactions there; he changed ſeveral laws in their favour." This column, therefore, Mr Savary concludes to have been erected by the inhabitants as a mark of their gratitude to Severus. And in a Greek inſcrip-tion,

† *Vide Spartian's Life of Severus*, chap. 17.

tion, now half effaced, but viſible on the weſt ſide when the ſun ſhines upon it, and which probably was legible in the time of Abulfeda, he ſuppoſes the name of Severus to have been preſerved. He further obſerves, that this was not the only monument erected to him by the gratitude of the Alexandrians: for there is ſtill ſeen in the midſt of the ruins of Antinoe, built by Adrian, a magnificent pillar, the inſcription on which is ſtill remaining dedicated to Alexander Severus.

On the ſouth-weſt ſide of the city, at a mile's diſtance, are ſituated the catacombs, the ancient burial-place of Alexandria; and although they cannot be compared to thoſe of the ancient Memphis, which the Arabs will not permit to be viſited, in order to make the better market of their mummies, it is probable that, the method of embalming being the ſame, the form of theſe catacombs can only differ in their proportions.—The Baron de Tott, in deſcribing theſe, obſerves, "that Nature not having furniſhed this part of Egypt with a ridge of rocks, like that which runs parallel with the Nile above Delta, the ancient inhabitants of Alexandria could only have an imitation by digging into a bed of ſolid rock; and thus they formed Necropolis, or the 'City of the Dead.' The excavation is from 30 to 40 feet wide, and 200 long and 25 deep, and is terminated by gentle declivities at each end. The two ſides, cut perpendicularly, contain ſeveral openings, about 10 or 12 feet in width and height, hollowed horizontally; and which form, by their different branches, ſubterranean ſtreets. One of theſe, which curioſity has diſencumbered from the ruins and ſands that render the entrance of others difficult or impoſſible, contains no mummies, but only the places they occupied. The order in which they were ranged is ſtill to be ſeen. Niches, 20 inches ſquare, ſunk ſix feet horizontally, narrowed at the bottom, and ſeparated from each other by partitions in the rock, ſeven or eight inches thick, divide into checkers the two walls of this ſubterranean vault. It is natural to ſuppoſe, from this diſpoſition, that each mummy was introduced with the feet foremoſt into the cell intended for its reception; and that new ſtreets were opened, in proportion as theſe dead inhabitants of Necropolis increaſed." This obſervation, he adds, which throws a light on the catacombs of Memphis, may perhaps likewiſe explain the vaſt ſize and multitude, as well as the different elevations, of the pyramids in the Higher and Lower Egypt.

About 70 paces from Pompey's pillar is the khalis, or the canal of the Nile, which was dug by the ancient Egyptians, to convey the water of the Nile to Alexandria, and fill the ciſterns under the city. On the ſide of the khalis are gardens full of orange and lemon trees, and the fields are full of caper and palm trees. On the top of a hill is a tower, on which a centinel is always placed, to give notice, by means of a flag, of the ſhips that are coming into the port. From this hill may be ſeen the ſea, the whole extent of the city, and the parts round it.

In going along the ſea-coaſt, there is a large baſon cut out of the rock that lines the ſhore. On the ſides of this baſon, two beautiful ſaloons are hewn out by the chiſel, with benches that run acroſs them. A canal made zig-zag, for the purpoſe of ſtopping the ſand by its different windings, conveys into them the water of the ſea, as pure and tranſparent as cryſtal. Seated on the ſtone bench, the water riſes a little above the waiſt; while the feet ſoftly repoſe on a fine ſand. The waves of the ſea are heard roaring againſt the rock, and foaming in the canal. The ſwell enters, raiſes you up, and leaves you; and thus alternately entering and retiring, brings a continual freſh ſupply of water, and a coolneſs which is truly delicious under a burning ſky. This place is vulgarly called the *Bath of Cleopatra*. Some ruins announce that it was formerly ornamented.

Alexandria is about fifty leauges north of Cairo. E. Long. 31 15. N. Lat. 31. 12.

Alexandria, a ſtrong and conſiderable city of Italy, belonging to the dutchy of Milan, with a good caſtle, built in 1178 in honour of Pope Alexander III. This pope made it a biſhopric, with ſeveral privileges and exemptions. Prince Eugene of Savoy took this city in 1706; after three days ſiege. The French took it in 1745; but the king of Sardinia, to whom it belongs by the treaty of Utrecht, retook it in 1746. The fortifications of the town are trifling, but the citadel is conſiderable. It is 15 miles ſouth-eaſt of Caſſal, 35 north-by-weſt of Genoa, and 40 ſouth-by-weſt of Milan. E. Long. 8. 40. N. Lat. 44. 53. The country about this town is called the *Alexandrin*.

Alexandria (anc. geog.), a city of Arachoſia, called alſo *Alexandropolis*, on the river Arachotus (Stephanus, Iſidorus Characenus).—Another *Alexandria* in Gedroſia, built by Leonatus, by order of Alexander (Pliny).—A third *Alexandria* in Aria, ſituated at the lake Arias (Ptolemy); but, according to Pliny, built by Alexander on the river Arius.—A fourth in the Bactriana (Pliny).—A fifth *Alexandria*, an inland town of Carmania (Pliny, Ptolemy, Ammian).—A ſixth *Alexandria*, or *Alexandropolis*, in the Sogdiana (Iſidorus Characenus).—A ſeventh in India, at the confluence of the Aceſines and Indus (Arrian).—An eighth called alſo *Alexandretta*, near the ſinus Iſſicus, on the confines of Syria and Cilicia, now *Scanderoon* (ſee Alexandretta), the port-town to Aleppo.—A ninth *Alexandria* of Margiana, which being demoliſhed by the barbarians, was rebuilt by Antiochus the ſon of Seleucus, and called *Antiochia* of Syria, (Pliny); watered by the river Margus, which is divided into ſeveral channels, for the purpoſes of watering the country, which was called *Zotale*. The city was ſeventy ſtadia in circuit, according to Pliny; who adds, that, after the defeat of Craſſus, the captives were conveyed to this place by Orodes the king of the Parthians.—A tenth, of the Oxiana, built on the Oxus by Alexander on the confines of Bactria (Pliny)—An eleventh, built by Alexander at the foot of mount Paropamiſus, which was called *Caucaſus* (Pliny, Arrian).—A twelfth *Alexandria* in Troas, called alſo *Troas* and *Antigonia* (Pliny).—A thirteenth on the Iaxartes, the boundary of Alexander's victories towards Scythia, and the laſt that he built on that ſide.

ALEXANDRIAN, in a particular ſenſe, is applied to all thoſe who profeſſed or taught the ſciences in the ſchool of Alexandria. In this ſenſe, Clemens is denominated *Alexandrinus*, though born at Athens. The ſame may be ſaid of Apion, who was born at Oaſis; and Aroſtarchus, by birth a Samothracian. The chief Alexandrian philoſophers were, Ammonius, Plotinus,

tinus, Origen, Porphyry, Jamblicus, Sopater, Maximus, and Dexippus.

ALEXANDRIAN is more particularly underſtood of a college of prieſts, conſecrated to the ſervice of Alexander Severus after his deification. Lampridius relates, that, notwithſtanding Severus was killed by Maximin, the ſenate proſecuted his apotheoſis; and, for regularity of worſhip, founded an order of prieſts, or *ſodalis*, under the denomination of *Alexandrini*.

ALEXANDRIAN Library. See p. 389, *ſupra*.

ALEXANDRIAN Manuſcript, a famous copy of the Scriptures, conſiſting of four volumes, in a large quarto ſize; which contains the whole Bible in Greek, including the Old and New Teſtament, with the Apocrypha, and ſome ſmaller pieces, but not quite complete. This manuſcript is now preſerved in the Britiſh Muſeum. It was ſent as a preſent to King Charles I. from Cyrillus Lucaris, patriarch of Conſtantinople, by Sir Thomas Rowe, ambaſſador from England to the Grand Signior, about the year 1628. Cyrillus brought it with him from Alexandria, where probably it was written. In a ſchedule annexed to it, he gives this account: That it was written, as tradition informed them, by Thecla, a noble Egyptian lady, about 1300 years ago, not long after the council of Nice. But this high antiquity, and the authority of the tradition to which the patriarch refers, have been diſputed; nor are the moſt accurate biblical writers agreed about its age. Grabe thinks that it might have been written before the end of the fourth century; others are of opinion, that it was not writ till near the end of the fifth century, or ſomewhat later.

ALEXANDRIAN, or *Alexandrine*, in poetry, a kind of verſe conſiſting of twelve, or of twelve and thirteen ſyllables alternately: ſo called from a poem on the life of Alexander, written in this kind of verſe by ſome French poet. Alexandrines are peculiar to modern poetry, and ſeem well adapted to epic poems. They are ſometimes uſed by moſt nations of Europe; but chiefly by the French, whoſe tragedies are generally compoſed of Alexandrines.

ALEXICACUS, ſomething that preſerves the body from harm or miſchief. The word amounts to much the ſame as *alexiterial*.

ALEXICACUS, in antiquity, was an attribute of Neptune, whom the tunny-fiſhers uſed to invoke under this appellation, that their nets might be preſerved from the ξιφιας, or ſword-fiſh, which uſed to tear them; and that he might prevent the aſſiſtance which it was pretended the dolphins uſed to give the tunnies on this occaſion.

ALEXIPHARMICS, in medicine, are properly remedies for expelling or preventing the ill effects of poiſon: but ſome of the moderns having imagined, that the animal ſpirits, in acute diſtempers, were affected by a malignant poiſon, the term has been underſtood to mean medicines adapted to expel this poiſon by the cutaneous pores, in the form of ſweat. In this ſenſe, alexipharmics are the ſame as ſudorifics.

ALEXIS, a Piedmonteſe. There is a book of "Secrets," which for a long time has gone under his name. It was printed at Baſil 1536. in 8vo, and tranſlated from Italian into Latin by Wecher; it has alſo been tranſlated into French, and printed ſeveral times with additions. There is a preface to the piece, wherein Alexis informs us, that he was born of a noble family; that he had from his moſt early years applied himſelf to ſtudy; that he had learned the Greek, the Latin, the Hebrew, the Chaldean, the Arabian, and ſeveral other languages; that having an extreme curioſity to be acquainted with the ſecrets of nature, he had collected as much as he could during his travels for 57 years; that he piqued himſelf upon not communicating his ſecrets to any perſon; but that when he was 82 years of age, having ſeen a poor man who had died of a ſickneſs which might have been cured had he communicated his ſecret to the ſurgeon who took care of him, he was touched with ſuch a remorſe of conſcience, that he lived almoſt like a hermit: and it was in this ſolitude that he ranged his ſecrets in ſuch an order as to make them fit to be publiſhed. The hawkers generally carry them, with other books, to the country fairs. Theſe, however, contain only the ſelect remedies of Seignor Alexis of Piedmont; the entire collection would make too large a volume for them.

ALEXITERIAL, among phyſicians, a term of much the ſame import with *alexipharmic*; though ſome times uſed in a ſynonymous ſenſe with amulet.

ALEYN (Charles), an Engliſh poet in the reign of Charles I. In 1631, he publiſhed two poems on the famous victories of Creſſy and Poictiers. He ſucceeded his father as clerk of the ordnance, and was commiſſary general of the artillery to the king at the battle of Edgehill. The next piece he wrote was a poem in honour of Henry VII. and the victory that gained him the crown of England. In 1636, the year before he died, he tranſlated the hiſtory of Eurialius and Lucretia, from the Latin epiſtles of Æneas Sylvius.

ALFANDIGA, the name of the cuſtomhouſe at Liſbon.

ALFAQUES, among the Moors, the name generally uſed for their clergy, or thoſe who teach the Mahometan religion; in oppoſition to the Morabites, who anſwer to monks among Chriſtians.

ALFATERNA (anc. geog.), the laſt town of Campania, beyond Veſuvius (Diodorus); the ſame with *Nocera*, which ſee. The inhabitants *Alfaterni* (Pliny).

ALFDOUCH, a name given by the Moors to a ſort of vermicelli, which they make of flour and water and are very fond of in their entertainments.

ALFET, in old cuſtoms, denotes a caldron full of boiling water, wherein an acuſed perſon, by way of trial or purgation, plunged his arm up to his elbow.

ALFROD, a town in Lincolnſhire, with a market on Tueſdays for proviſions and corn; and two fairs, on Whit-Tueſday, and November 8. for cattle and ſheep. It is ſeated on a ſmall brook that runs through the town, and is a compact place. A ſalt ſpring was diſcovered here in 1670, from the pigeons which flew thither in great numbers to drink the water; thoſe birds being known to be fond of ſalt. It contains a purging ſalt, together with a portion of ſea-ſalt. It is ſtrongly purgative. It is recommended as cooling, cleanſing, and attenuating. As a good remedy in the ſcurvy, jaundice, and other glandular obſtructions. It alſo promotes urine and ſweat, and therefore is good in gravelly and other diſorders of the kidneys and bladder; and in complaints ariſing from obſtructed perſpiration. Alford is ſix miles from the ſea, and 20 N. of Boſton. E. Long. 0. 15. N. Lat. 53. 30.

Alfred.

ALFRED, or ÆLFRED, the Great, king of England, was the fifth and youngeſt ſon of Æthelwolf king of the Weſt Saxons, and was born at Wantage in Berkſhire in 849. He diſtinguiſhed himſelf, during the reign of his brother Ethelred, in ſeveral engagements againſt the Danes; and upon his death ſucceeded to the crown, in the year 871, and the 22d of his age. At his aſcending the throne he found himſelf involved in a dangerous war with the Danes, and placed in ſuch circumſtances of diſtreſs as called for the greateſt valour, reſolution, and all the other virtues with which he was adorned. The Danes had already penetrated into the heart of his kingdom; and before he had been a month on the throne, he was obliged to take the field againſt thoſe formidable enemies. After many battles gained on both ſides, he was at length reduced to the greateſt diſtreſs, and was entirely abandoned by his ſubjects. In this ſituation, Alfred, conceiving himſelf no longer a king, laid aſide all marks of royality, and took ſhelter in the houſe of one who kept his cattle. He retired afterwards to the iſle of Æthelingey in Somerſetſhire, where he built a fort for the ſecurity of himſelf, his family, and a few faithful ſervants who repaired thither to him. When he had been about a year in this retreat, having been informed that ſome of his ſubjects had routed a great army of the Danes, killed their chiefs, and taken their magical ſtandard (A), he iſſued his letters, giving notice where he was, and inviting his nobility to come and conſult with him. Before they came to a final determination, Alfred, putting on the habit of a harper, went into the enemy's camp, where without ſuſpicion, he was every where admitted, and had the honour to play before their princes. Having thereby acquired an exact knowledge of their ſituation, he returned in great ſecrecy to his nobility, whom he ordered to their reſpetive homes, there to draw together each man as great a force as he could; and upon a day appointed there was to be a general rendezvous at the great wood, called *Selwood*, in Wiltſhire. This affair was tranſacted ſo ſecretly and expeditiouſly, that, in a little time, the king, at the head of an army, approached the Danes, before they had the leaſt intelligence of his deſign. Alfred, taking advantage of the ſurpriſe and terror they were in, fell upon them, and totally defeated them at Æthendune, now Eddington. Thoſe who eſcaped fled to a neighbouring caſtle, where they were ſoon beſieged, and obliged to ſurrender at diſcretion. Alfred granted them better terms than they could expect. He agreed to give up the whole kingdom of the Eaſt-Angles to ſuch as would embrace the Chriſtian religion, on condition they would oblige the reſt of their countrymen to quit the iſland, and, as much as it was in their power, prevent the landing of any more foreigners. For the performance thereof he took hoſtages; and when, in purſuance of the treaty, Guthrum the Daniſh captain came, with thirty of his chief officers, to be baptized, Alfred anſwered for him at the font, and gave him the name of *Æthelſtane;* and certain laws were drawn up between the king and Guthrum for the regulation and government of the Danes ſettled in England. In 884, a freſh number of Danes landed in Kent, and laid ſiege to Rocheſter; but the king coming to the relief of that city, they were obliged to abandon their deſign. Alfred had now great ſucceſs; which was chiefly owing to his fleet, an advantage of his own creating. Having ſecured the ſea-coaſts, he fortified the reſt of the kingdom, with caſtles and walled towns; and he beſieged and recovered from the Danes the city of London, which he reſolved to repair, and keep as a frontier (B).

Alfred.

After ſome years reſpite, Alfred was again called into the field: for a body of Danes, being worſted in the weſt of France, came with a fleet of 250 ſail on the coaſt of Kent; and having landed, fixed themſelves at Apple-tree: ſhortly after, another fleet of 80 veſſels coming up the Thames, the men landed, and built a fort at Middleton. Before Alfred marched againſt the enemy, he obliged the Danes, ſettled in Northumberland and Eſſex, to give him hoſtages for their good behaviour. He then moved towards the invaders, and pitched his camp between their armies, to prevent their junction. A great body, however, moved off to Eſſex; and croſſing the river, came to Farnham in Surry, where they were defeated by the king's forces. Mean while the Danes ſettled in Northumberland, in breach of treaty, and notwithſtanding the hoſtages given, equipped two fleets; and, after plundering the northern and ſouthern coaſts, ſailed to Exeter, and beſieged it. The king, as ſoon as he received intelligence, marched againſt them; but before he reached Exeter, they had got poſſeſſion of it. He kept them, however, blocked up on all ſides; and reduced them at laſt to ſuch extremities, that they were obliged to eat their horſes, and were even ready to devour each other. Being at length rendered deſperate, they made a general ſally on the beſiegers;

(A) "This (ſays Sir John Spelman) was a banner with the image of a raven magically wrought by the three ſiſters of Hinguar and Hobba, on purpoſe for their expedition, in revenge of their father Lodebroch's murder, made, they ſay, almoſt in an inſtant, being by them at once begun and finiſhed in a noontide, and believed by the Danes to have carried great fatality with it, for which it was highly eſteemed by them. It is pretended, that being carried in battle, towards good ſucceſs it would always ſeem to clap its wings, and make as if it would fly; but towards the approach of miſhap, it would hang down and not move." *Life of Alfred*, p. 61.

(B) The Danes had poſſeſſed themſelves of London in the time of his father; and had held it till now as a convenient place for them to land at, and fortify themſelves in; neither was it taken from them but by a cloſe ſiege. However, when it came into the king's hands, it was in a miſerable condition, ſcarce habitable, and all its fortifications ruined. The king, moved by the importance of the place, and the deſire of ſtrengthening his frontier againſt the Danes, reſtored it to its ancient ſplendor. And obſerving, that, through the confuſion of the times, many, both Saxons and Danes, lived in a looſe diſorderly manner, without owning any government, he offered them now a comfortable eſtabliſhment, if they would ſubmit and become his ſubjects. This propoſition was better received than he expected; for multitudes growing weary of a wagabond kind of life, joyfully accepted ſuch an offer. *Chron. Sax.* p. 88.

Alfred. siegers; but were defeated, though with great loss on the king's side. The remainder of this body of Danes fled into Essex, to the fort they had built there, and to their ships. Before Alfred had time to recruit himself, another Danish leader, whose name was Laf, came with a great army out of Northumberland, and destroyed all before him, marching on to the city of Werheal in the west, which is supposed to be Chester, where they remained the rest of that year. The year following they invaded North-Wales; and after having plundered and destroyed every thing, they divided, one body returning to Northumberland, another into the territories of the East-Angles; from whence they proceeded to Essex, and took possession of a small island called *Meresig*. Here they did not long remain: for having parted, some sailed up the river Thames, and others up the Lea-road; where drawing up their ships, they built a fort not far from London, which proved a great check upon the citizens, who went in a body and attacked it, but were repulsed with great loss: at harvest-time the king himself was obliged to encamp with a body of troops in the neighbourhood of the city, in order to cover the reapers from the excursions of the Danes. As he was one day riding by the side of the river Lea, after some observations, he began to think that the Danish ships might be laid quite dry; this he attempted, and succeeded; so that the Danes deserted their fort and ships, and marched away to the banks of the Severn, where they built a fort, and wintered at a place called *Quatbrig* (c). Such of the Danish ships as could be got off, the Londoners carried into their own road; the rest they burnt and destroyed.

Alfred enjoyed a profound peace during the three last years of his reign, which he chiefly employed in establishing and regulating his government, for the security of himself and his successors, as well as the ease and benefit of his subjects in general. After a troublesome reign of 28 years, he died on the 28th of October A. D. 900; and was buried at Winchester, in Hyde-abbey, under a monument of porphyry.

All the historians agree in distinguishing him as one of the most valiant, wisest, and best of kings that ever reigned in England; and it is also generally allowed, that he not only digested several particular laws still in being, but that he laid the first foundation of their present happy constitution. There is great reason to believe that they are indebted to this prince for trials by juries; and the doomsday book, which is preserved in the exchequer, is thought to be no more than another edition of Alfred's book of Winchester, which contained a survey of the kingdom. It is said also, that he was the first who divided the kingdom into shires, what is ascribed to him is not a bare division of the country, but the settling a new form of judicature; for after having divided his dominions into shires, he subdivided each shire into three parts, called *trythings*. There are some remains of this ancient division in the ridings of Yorkshire, the laths of Kent, and the three parts of Lincolnshire. Each trything was divided into hundreds or wapentakes; and these again into tythings or dwellings of ten householders: each of these householders stood engaged to the king, as a pledge for the good behaviour of his family, and all the ten were mutually pledges for each other; so that if any one of the tything was suspected of an offence, if the head boroughs or chiefs of the tything would not be security for him, he was imprisoned; and if he made his escape, the tything and hundred were fined to the king. Each shire was under the government of an earl, under whom was the reive, his deputy; since, from his office, called *shire-reive*, or *sheriff*. And so effectual were these regulations, that it is said he caused bracelets of gold to be hung up in the highways, as a challenge to robbers and they remained untouched.

In private life, Alfred was the most amiable man in his dominions; of so equal a temper, that he never suffered either sadness or unbecoming gaiety to enter his mind; but appeared always of a calm, yet cheerful disposition, familiar to his friends, just even to his enemies, kind and tender to all. He was a remarkable œconomist of his time, and Asserius has given us an account of the method he took for dividing and keeping an account of it: he caused six wax-candles to be made, each 12 inches long, and of as many ounces weight; on the candles the inches were regularly marked, and having found that one of them burnt just four hours, he committed them to the care of the keepers of his chapel, who from time to time gave him notice how the hours went: but as in windy weather the candles were wasted by the impression of the air on the flame, to remedy this inconvenience, he invented lanthorns, there being then no glass in his dominions.

This prince, we are told, was 12 years of age before a master could be procured in the western kingdom to teach him the alphabet; such was the state of learning when Alfred began to reign. He had felt the misery of ignorance; and determined even to rival his cotemporary Charlemagne in the encouragement of literature. He is supposed to have appointed persons to read lectures at Oxford, and is thence considered as the founder of that university. By other proper establishments, and by a general encouragement to men of abilities, he did every thing in his power to diffuse knowledge throughout his dominions. Nor was this end promoted more by his countenance and encouragement than by his own example and his writings. For notwithstanding the lateness of his initiation, he had acquired extraordinary erudition: and, had he not been illustrious as a king, he would have been famous as an author. His works are, 1. *Breviarum quoddam collectum ex Legibus Trojanorum*, &c. lib. I. A Breviary collected out of the Laws of the Trojans, Greeks, Britons, Saxons, and Danes, in one Book. Leland saw this book in the Saxon tongue, at Christ-church in Hampshire. 2. *Visi-Saxonum Leges*, lib. I. The laws of the West-Saxons, in one book. Pitts tells us, that it is in Bennet-

(c) The king's contrivance is thought to have produced the meadow between Hertford and Bow; for at Hertford was the Danish fort, and from thence they made frequent excursions on the inhabitants of London. Authors are not agreed as to the method the king pursued in laying dry the Danish ships: Dugdale supposes that he did it by straitening the channel; but Henry of Huntingdon alledges, that he cut several canals, which exhausted its water.

net-College library, at Cambridge. 3 *Instituta quædam*, lib. 1. Certain Institutes, in one book. This is mentioned by Pitts, and seems to be the second capitulation with Guthrum. 4. *Contra judices iniquos*, lib. I. An Invective against Unjust Judges, in one book. 5. *Acta Magistratuum suorum*, lib. I. Acts of his Magistrates, in one book. This is supposed to be the book of judgments mentioned by Horne; and was, in all probability, a kind of reports, intended for the use of succeeding ages. 6. *Regum fortunæ variæ*, lib. I. The various Fortunes of Kings, in one book. 7. *Dicta sapientum*, lib. I. The Sayings of Wise Men, in one book. 8. *Parobolæ et sales*, lib. I. Parables and pleasant sayings, in one book. 9. *Collectiones chronicorum*. Collections of Chronicles. 10. *Epistolæ ad Wulfsigium Episcopum*, lib. I. Epistles to Bishop Wulfsig, in one book. 11. *Manuale meditationum*. A Manual of Meditations.—Besides these original works, he translated many authors from the Latin, &c. into the Saxon language, *viz*. 1. Bede's History of England. 2. Paulinus Orosinus's History of the Pagans. 3. St Gregory's Pastoral, *&c*. The first of these, with his prefaces to the others, together with his laws, were printed at Cambridge, 1644. His laws are likewise inserted in Spelman's Councils. 4. *Boethius de Consolatione*, lib. V. Boetius's Consolations of Philosophy, in five books. Dr Plot tells us, king Alfred translated it at Woodstock, as he found in a MS. in the Cotton Library. 5. *Æsopi Fabulæ*, Æsops Fables: which he is said to have translated from the Greek both into Latin and Saxon. 6. *Psalterium Davidicum*, lib. I. David's Psalter, in one book. This was the last work the King attempted, death surprising him before he had finished it; it was however completed by another hand, and published at London in 1640, in quarto, by Sir John Spelman. Several others are mentioned by Malmsbury; and the old history of Ely asserts, that he translated the Old and New Testaments.

The life of this great king was first written by Asserius Menevensis: and first published by Archbishop Parker, in the old Saxon character, at the end of his edition of Hassingham's history, printed in 1674, fol.

ALGA, in botany, the trivial name of the lichen, fucus, and several other plants of the cryptogamia class.

ALGÆ, Flags; one of the seven families or natural tribes into which the whole vegetable kingdom is divided by Linnæus in his *Philosophia Botanica*. They are defined to be plants, whose root, leaf, and stem are all one. Under this description are comprehended all the sea-weeds, and some other aquatic plants. In the sexual system, they constitute the 3d order of the 24th class *Cryptogamia*; in Tournefort, the second genus of the second section, *Marinæ, aut fluviatiles*, of the 17th class *Aspermæ vulgo habitæ*; and the 57th order in Linnæus's Fragments of a Natural Method. The discoveries made in this part of the vegetable kingdom are uncertain and imperfect; and the attempts, in particular, to arrange flags by the parts of the fructification, have not been attended with great success. Dillenius has arranged this order of plants from their general habit and structure; Michelius from the parts of fructification.—Each has considerable merit.

ALGAGIOLA, a small sea-port town in the island of Corsica, fortified with walls and bastions. It was almost destroyed by the mal-contents in 1731, but has since been repaired. E. Long. 9. 45. N. lat. 42. 20.

ALGAROT, in chemistry, an Arabic term for an emetic powder, prepared from regulus of antimony, dissolved in acids, and separated by repeated lotions in warm water.

ALGAROTTI (Count) a celebrated Italian, was born at Padua; but the year is not metioned. Led by curiosity, as well as a desire of improvement, he travelled early into foreign countries; and was very young when he arrived in France in 1736. Here he composed his "Newtonian Philosophy for the Ladies;" as Fontennelle had done his Cartesian Astronomy, in the work entitled, "The plurality of worlds." He was noticed by the king of Prussia, who gave him marks of the esteem he had for him. He died at Pisa the 23d of May, 1764; and ordered his own mausoleum, with this inscription to be fixed upon it: Hic jacet Algarottus, sed non omnis." He is allowed to have been a very great connoisseur in painting, sculpture, and architecture. He contributed much to the reformation of the Italian opera. His works which are numerous, and upon a variety of subjects, abound with vivacity, elegance, and wit: a collection of them has lately been made, and printed at Leghorn.

ALGARVA, a province in the kingdom of Portugal, 67 miles in length and 20 in breadth: bounded on the W. and S. by the sea, on the E. by the river Guadiana, and on the N. by Alenteja. It is very fertile in figs, almonds, dates, olives, and excellent wines; besides, the fishery brings in large sums. The capital town is Pharo. It contains four cities, 12 towns, 67 parishes, and 61,000 inhabitants.

A L G E B R A,

Definition and etymology.

A General method of computation, wherein signs and symbols, commonly the letters of the alphabet are made use of to represent numbers, or any other quantities.

This science, properly speaking, is no other than a kind of short-hand, or ready way of writing down a chain of mathematical reasoning on any subject whatever; so that it is applicable to arithmetic, geometry, astronomy, mensuration of all kinds of solids, &c. and the great advantages derived from it appear manifestly to arise from the conciseness and perspicuity with which every proposition on mathematical subjects can be written down in algebraic characters, greatly superior to the tedious circumlocutions which would be necessary were the reasoning to be written in words at length.

With regard to the etymology of the word *algebra*, it is much contested by the critics. Menage derives it from the Arabic *algiabarat*, which signifies the restitution of any thing broken; supposing that the principal part of algebra is the consideration of broken numbers. Others rather borrow it from the Spanish, *algebrista*, a person who replaces dislocated bones; adding,

ding, that algebra has nothing to do with fraction. Some, with M. d'Herbelot, are of opinion, that algebra takes its name from Gebar, a celebrated philosopher, chemist, and mathematician, whom the Arabs call Giaber, and who is supposed to have been the inventor. Others from *gefr*, a kind of parchment made of the skin of a camel, whereon Ali and Giafer Sakek wrote, in mystic characters, the fate of Mahometanism, and the grand events that were to happen till the end of the world. But others, with more probability, derive it from *geber*; a word whence, by prefixing the article *al*, we have formed *algebra*; which is pure Arabic, and properly signifies the reduction of fractions to a whole number. However, the Arabs, it is to be observed, never use the word *algebra* alone, to express what we mean by it; but always add to it the word *macabelah*, which signifies opposition and comparison: thus *algebra-almacabelah*, is what we properly call *algebra*.

Some authors define algebra, The art of solving mathematical problems; but this is rather the idea of analysis, or the analytic art. The Arabs call it, *The art of restitution and comparison*; or, *The art of resolution and equation*. Lucas de Burgo, the first European who wrote of algebra, calls it, *Regula rei et census*: that is, the rule of the root and its square; the root with them being called *res*, and the square *census*. Others call it *Specious Arithmetic*; and some *Universal Arithmetic*.

History.

It is highly probable that the Indians or Arabians first invented this noble art: for it may be reasonably supposed, that the ancient Greeks were ignorant of it; because Pappus, in his mathematical collections, where he enumerates their analysis, makes no mention of any thing like it; and, besides, speaks of a local problem, begun by Euclid, and continued by Apollonius, which none of them could fully resolve; which doubtless they might easily have done, had they known any thing of algebra.

Diaphantus was the first Greek writer of algebra; who published 13 books about the year 800, though only six of them were translated into Latin, by Xylander, in 1575; and afterwards, *viz. anno* 1721, in Greek and Latin, by M. Buchet and Fermat, with additions of their own. This algebra of Diaphantus's only extends to the solution of arithmetical indeterminate problems.

Before this translation of Diaphantus came out, Lucas Pacciolus, or Lucas de Burgo, a Minorite friar, published at Venice, in the year 1494, an Italian treatise of algebra. This author makes mention of Leonardus Pisanus, and some others, of whom he had learned the art; but we have none of their writings. He adds, that algebra came originally from the Arabs, and never mentions Diaphantus; which makes it probable, that that author was not then known in Europe. His algebra goes no farther than simple and quadratic equations.

After Pacciolus appeared Stifelius, a good author; but neither did he advance any farther.

After him came Scipio Ferreus, Cardan, Tartagilla, and some others, who reached as far as the solution of some cubic equations. Bombelli followed these, and went a little farther. At last came Nunnius, Ramus, Schoner, Salignac, Clavius, &c. who all of them took different courses, but none of them went beyond quadratics.

In 1590, Vieta introduced what he called his *Specious Arithmetic*, which consists in denoting the quantities, both known and unknown, by symbols or letters. He also introduced an ingenious method of extracting the roots of equations, by approximations; since greatly improved and facilitated by Ralphson, Halley, Maclaurin, Simpson, and others.

Vieta was followed by Oughtred, who, in his *Clavis Mathematica*, printed in 1631, improved Vieta's method, and invented several compendious characters, to show the sums, differences, rectangles, squares, cubes, &c.

Harriot, another Englishman, cotemporary with Oughtred, left several treatises at his death; and among the rest, an Analysis, or Algebra, which was printed in 1631, where Vieta's method is brought into a still more commodious form, and is much esteemed to this day.

In 1657, Des Cartes published his geometry, wherein he made use of the literal calculus and the algebraic rules of Harriot; and as Oughtred in his Clavis, and Marin. Ghetaldus in his books of mathematical composition and resolution published in 1630, applied Vieta's arithmetic to elementary geometry, and gave the construction of simple and quadratic equations; so Des Cartes applied Harriot's method to the higher geometry, explaining the nature of curves by equations, and adding the constructions of cubic, biquadratic, and other higher equations.

Des Cartes's rule for constructing cubic and biquadratic equations, was farther improved by Thomas Baker, in his *Clavis Geometrica Catholica*, published in 1684; and the foundation of such constructions, with the application of algebra to the quadratures of curves, questions *de maximis et minimis*, the centrobaryc method of Guldinus, &c. was given by R. Slusius, in 1668; as also by Fermat in his *Opera Mathematica*, Roberval in the *Mem. de Mathem. et de Phisique*, and Barrow in his *Lect. Geomet.* In 1708, algebra was applied to the laws of chance and gaming, by R. de Montmort; and since by de Moivre and James Bernouilli.

The elements of the art were compiled and published by Kersey, in 1671; wherein the specious arithmetic, and the nature of equations, are largely explained, and illustrated by a variety of examples: the whole substance of Diophantus is here delivered, and many things added concerning mathematical composition and resolution from Ghetaldus. The like has been since done by Prestet in 1694, and by Ozanam in 1703: but these authors omit the application of algebra to geometry; which defect is supplied by Guisnec in a French treatise expressly on the subject published in 1704, and l'Hopital in his analytical treatise of the conic sections in 1707. The rules of algebra are also compendiously delivered by Sir Isaac Newton, in his *Arithmetica Universalis*, first published in 1707, which abounds in select examples, and contains several rules and methods invented by the author.

Algebra has also been applied to the consideration and calculus of infinites; from whence a new and extensive branch of knowledge has arisen, called the *Doctrine of Fluxions*, or *Analysis of Infinites*, or the *Calculus Differentialis*.

P A R T I.

Introduction.

Introduction.

A Quantity which can be measured, and is the object of mathematics, is of two kinds, *Number* and *Extension*. The former is treated of in *Arithmetic*; the latter in *Geometry*.

Numbers are ranged in a scale, by the continued repetition of some one number, which is called the *Root*; and, in consequence of this order, they are conveniently expressed in words, and denoted by characters. The operations of arithmetic are easily derived from the established method of notation, and the most simple reasonings concerning the relations of magnitude.

Investigations by the common arithmetic are greatly limited, from the want of characters to express the quantities that are unknown, and their different relations to one another, and to such as are known. Hence letters and other convenient symbols have been introduced to supply this defect; and thus gradually has arisen the science of *Algebra*, properly called *Universal Arithmetic*.

In the common arithmetic too, the given numbers disappear in the course of the operation, so that general rules can seldom be derived from it; but, in algebra, the known quantities, as well as the unknown, may be expressed by letters, which, through the whole operation, retain their original form; and hence may be deduced, not only general canons for like cases, but the dependence of the several quantities concerned, and likewise the determination of a problem, without exhibiting which, it is not completely resolved. This general manner of expressing quantities also, and the general reasonings concerning their connections, which may be founded on it, have rendered this science not less useful in the demonstration of theorems than in the resolution of problems.

If geometrical quantities be supposed to be divided into equal parts, their relations, in respect of magnitude, or their proportions, may be expressed by numbers; one of these equal parts being denoted by the unit. Arithmetic, however, is used in expressing only the conclusions of geometrical propositions; and it is by algebra that the bounds and application of geometry have been of late so far extended.

The proper objects of mathematical science are number and extension; but mathematical inquiries may be instituted also concerning any physical quantities that are capable of being measured or expressed by numbers and extended magnitudes: And, as the application of algebra may be equally universal, it has been called *The science of quantity in general*.

Definitions.

Definitions.

1. Quantities which are known are generally represented by the first letters of the alphabet, as a, b, c, &c. and such as are unknown by the last letters, as x, y, z, &c.
2. The sign $+$ (*plus*) denotes, that the quantity before which it is placed is to be added. Thus $a+b$ denotes the sum of a and b; $3+5$ denotes the sum of 3 and 5, or 8. When no sign is expressed, $+$ is understood.
3. The sign $-$ (*minus*) denotes, that the quantity before which it is placed is to be subtracted. Thus $a-b$ denotes the excess of a above b; $6-2$ is the excess of 6 above 2, or 4. *Note*, These characters $+$ and $-$, from their extensive use in algebra, are called *the signs*; and the one is said to be *opposite* or *contrary* to the other.
4. Quantities which have the sign $+$ prefixed to them are called *positive* or *affirmative*; and such as have the sign $-$ prefixed to them are called *negative*.
5. Quantities which have the same sign, either $+$ or $-$, are also said to have *like signs*, and those which have different signs are said to have *unlike signs*. Thus $+a$, $+b$, have like signs, and $+a$, $-c$, are said to have unlike signs.
6. The *juxtaposition* of letters as in the same word, expresses the product of the quantities denoted by these letters. Thus ab expresses the product of a and b; bcd expresses the continued product of b, c, and d. The sign $\times$ also expresses the product of any two quantities between which it is placed.
7. A number prefixed to a letter is called a *numerable coefficient*, and expresses the product of the quantity by that number, or how often the quantity denoted by the letter is to be taken. When no number is prefixed, unit is understood.
8. The *quotient* of two quantities is denoted by placing the *dividend* above a small line and the *divisor* below it. Thus $\frac{18}{3}$ is the quotient of 18 divided by 3, or 6; $\frac{a}{b}$ is the quotient of a divided by b. This expression of a quotient is also called a *fraction*.
9. A quantity is said to be *simple*, which consists of one part or *Term*, as $+a$, $-abc$; and a quantity is said to be *compound*, when it consists of more than one term connected by the signs $+$ or $-$. Thus $a+b$, $a-b+c$, are compound quantities. If there are two terms, it is called a *binomial*; if three, a *trinomial*, &c.
10. Simple quantities, or the terms of compound quantities, are said to be *like*, which consist of the same letter or letters, equally repeated. Thus $+ab$, $-5ab$, are like quantities; but $+ab$, and $+aab$, are unlike.
11. The equality of two quantities is expressed, by placing the sign $=$ between them. Thus $x+a=b-c$, means that the sum of x and a is equal to the excess of b above c.

When quantities are considered abstractly, then $+$ and $-$ denote addition and subtraction only, according to Def. 2. and 3. and the terms *positive* and *negative* express the same ideas. In that case, a negative quantity by itself is unintelligible. The sign $+$ also is unnecessary before simple quantities, or before the leading term of a compound quantity which is not negative; though, when such a quantity or term is to be added to another, $+$ must be placed before it, to express that addition; and hence in Def. 2. it is said, that $+$ is understood when no sign is expressed.

In geometry, however, and in certain applications of

Fundamental operations.

of geometry and algebra, there may be an opposition or contrariety in the quantities, analogous to that of addition and subtraction; and the signs + and — may very conveniently be used to express that contrariety. In such cases, negative quantities are understood to exist by themselves; and the same rules take place in operations into which they enter, as are used with regard to the negative terms of abstract quantities.

CHAP. I.

Sect. I. *Fundamental Operations.*

The fundamental operations in algebra are the same as in common arithmetic, *Addition*, *Subtraction*, *Multiplication*, and *Division*; and from the various combinations of these four, all the others are derived.

Prob. I. *To add quantities.*

Simple quantities, or the terms of compound quantities, to be added together, may be *like with like signs*, *like with unlike signs*, or they may be *unlike*.

Case 1. To add terms that are like and have like signs.

Rule. Add together the coefficients, to their sum prefix the common sign, and subjoin the common letter or letters.

Examp. To $5ab$ Add $4ab$ Sum $9ab$

$$\begin{array}{r} 3aa-ab \\ 7aa-2ab \\ 4aa-5ab \\ \hline 14aa-8ab. \end{array}$$

Case 2. To add terms that are like, but have unlike signs.

Rule. Subtract the less coefficient from the greater; prefix the sign of the greater to the remainder, and subjoin the common letter or letters.

Examp.

$$\begin{array}{r} -4a \\ +7a \\ \hline +3a \end{array} \qquad \begin{array}{r} +7bc \\ -3bc \\ +bc \\ \hline +5bc \end{array} \qquad \begin{array}{r} -5ab \\ +2ab \\ +3ab \\ \hline 0 \end{array}$$

Case 3. To add terms that are unlike.

Rule. Set them all down, one after another, with their signs and coefficients prefixed.

Examp.

$$\begin{array}{r} 2a+3b \\ -5c+8 \\ \hline 2a+3b-5c+8 \end{array}$$

Compound quantities are added together, by uniting the several terms of which they consist by the preceding rules.

Examp. The sum of $\left\{\begin{array}{l} 5ab-3xy-12cd \\ 7xy-ab+15 \\ 9cd-xy-mn \end{array}\right.$

is $4ab-3cd+15-mn+3xy$

The rule for case 2. may be considered as the general rule for adding all algebraical quantities whatsoever; and, by the rules in the two preceding cases, the like terms in the quantity to be added may be united, so as to render the expression in the sum more simple.

Prob. II. *To Subtract Quantities.*

General Rule. Change the signs of the quantity to be subtracted into the contrary signs, and then add it, so changed, to the quantity from which it was to be subtracted (by Prob. I.); and the sum arising by this addition is the remainder.

Examp. From $+5a$ Subtract $+3a$ Rem. $+2a$

$$\begin{array}{r} 7ab-16bc \\ 3ab+mb \\ \hline 4ab-16bc-mb \end{array}$$

From $5a-7b+9c+8$
Subt. $2a-4b+9c-d$
Rem. $3a-3b*+8+d$

When a positive quantity is to be subtracted, the rule is obvious from Def. 3.: In order to show it, when the negative part of a quantity is to be subtracted, let $c-d$ be subtracted from a, the remainder, according to the rule, is $a-c+d$. For if c is subtracted from a, the remainder is $a-c$ (by Def. 3.); but this is too small, because c is subtracted instead of $c-d$, which is less than it by d; the remainder therefore is too small by d; and d being added, it is $a-c+d$; according to the rule.

Otherwise If the quantity d be added to these two quantities a and $c-d$, the difference will continue the same; that is, the excess of a above $c-d$ is equal to the excess of $a+d$ above $c-d+d$; that is, to the excess of $a+d$ above c, which plainly is $a+d-c$, and is therefore the remainder required.

Prob. III. *To multiply Quantities.*

General Rule for the Signs. When the signs of the two terms to be multiplied are like, the sign of the product is +; but, when the signs are unlike, the sign of the product is —.

Case 1. To multiply two terms.

Rule. Find the sign of the product by the general rule; after it place the product of the numeral coefficients, and then set down all the letters one after another, as in one word.

Mult.	$+a$	$+5b$	$-5ax$
By	$+b$	$-3c$	$-7ab$
	$+ab$	$-15bc$	$+35aabx$

The reason of this rule is derived from Def. 6. and from the nature of multiplication, which is a repeated addition of one of the quantities to be multiplied as often as there are units in the other. Hence also the letters in two terms multiplied together may be placed in any order, and therefore the order of the alphabet is generally preferred.

Case 2. To multiply compound quantities.

Rule. Multiply every term of the multiplicand by all the terms of the multiplier, one after another, according to the preceding rule, and then collect all the products into one sum; that sum is the product required.

Fundamental operations.

Examp.

$$\begin{array}{lll} \text{Mult.} & 2a+3b & m+x \\ \text{By} & 3ax-4by & m-x \\ \hline & 6aax+9abx & mm+mx \\ & \quad -8aby-12bby & \quad -mx-xx \\ \hline \text{Prod.} & 6aax+9abx-8aby-12bby & mm*-xx \end{array}$$

$$\begin{array}{ll} \text{Mult.} & a-b \\ \text{By} & c-d \\ \hline & ac-cb \\ & \quad -ad+db \\ \hline \text{Prod.} & ac-cb-ad+db \end{array}$$

Of the general Rule for the Signs.

The reason of that rule will appear by proving it, as applied to the last mentioned example of $a-b$ multiplied by $c-d$, in which every case of it occurs.

Since multiplication is a repeated addition of the multiplicand as often as there are units in the multiplier, hence, if $a-b$ is to be multiplied by c, $a-b$ must be added to itself as often as there are units in c, and the product therefore must be $ca-cb$ (Prob. I.)

But this product is too great; for $a-b$ is to be multiplied, not by c, but by $c-d$ only, which is the excess of c above d; d times $a-b$ therefore, or $da-db$, has been taken too much; hence this quantity must be subtracted from the former part of the product, and the remainder, which (by Prob. II.) is $ca-cb-da+db$, will be the true product required.

Def. 12. When several quantities are multiplied together, any of them is called a *factor* of the product.

13. The products arising from the continual multiplication of the same quantity are called the *powers* of that quantity, which is the root. Thus, aa, aaa, $aaaa$, &c. are powers of the root a.

14. These powers are expressed, by placing above the root, to the right hand, a figure, denoting how often the root is repeated. This figure is called an *index*, or *exponent*, and from it the power is denominated. Thus,

$$\left.\begin{array}{r} a \\ aa \\ aaa \\ aaaa \end{array}\right\} \text{is called the} \left\{\begin{array}{l} \text{1st} \\ \text{2d} \\ \text{3d} \\ \text{4th} \end{array}\right\} \begin{array}{l} \text{Power of the root} \\ a\text{, and is other-} \\ \text{wise expressed} \\ \text{by} \end{array} \left\{\begin{array}{l} a^1 \text{ or } a \\ a^2 \\ a^3 \\ a^4\text{, \&c.} \end{array}\right.$$

The 2d and 3d powers are generally called the *square* and *cube*; and the 4th, 5th and 6th, are also sometimes respectively called the *biquadrate*, *sursolid*, and *cubocube*.

Cor. Powers of the same root are multiplied by adding their exponents, Thus, $a^3 \times a^2 = a^5$, or $aaa \times aa = aaaaa$, $b^3 \times b = b^4$.

Scholium.

Sometimes it is convenient to express the multiplication of quantities, by setting them down with the sign ($\times$) between them, without performing the operation according to the preceding rules; thus $a^2 \times b$ is written instead of a^2b; and $\overline{a-b} \times \overline{c-d}$ expresses the product of $a-b$, multiplied by $c-d$.

Def. 15. A *vinculum* is a line drawn over any number of terms of a compound quantity, to denote those which are understood to be affected by the particular sign connected with it.

Thus, in the last example, it shows that the terms $+a$ and $-b$, and also c and $-d$ are all affected by the sign ($\times$). Without the vinculum, the expression $a-b\times c-d$ would mean the excess of a above bc and d; and $\overline{a-b}\times c-d$ would mean the excess of the product of $a-b$ by c, above d. Thus also $\overline{a+b}|^2$ expresses the second power of $a+b$, or the product of that quantity multiplied by itself; whereas $a+b^2$ would express only the sum of a and b^2; and so of others. By some writers a parenthesis ( ) is used as a vinculum, and $(a+b)^2$ is the same thing as $\overline{a+b}|^2$.

PROB. IV. *To divide Quantities.*

General Rule for the Signs. If the signs of the divisor and dividend are like, the sign of the quotient is +; if they are unlike, the sign of the quotient is —.

This rule is easily deduced from that given in Prob. III.; for, from the nature of division, the quotient must be such a quantity as, multiplied by the divisor, shall produce the dividend with its proper sign.

From Def. 8. The quotient of any two quantities may be expressed, by placing the dividend above a line and the divisor below it. But a quotient may often be expressed in a more simple and convenient form, as will appear from the following distinction of the cases.

Case I. When the divisor is simple, and is a factor of all the terms of the dividend. This is easily discovered by inspection; for then the coefficient of the divisor measures that of all the terms of the dividend, and all the letters of the divisor are found in every term of the dividend.

Rule. The letter or letters in the divisor are to be expunged out of each term in the dividend, and the coefficients of each term to be divided by the coefficient of the divisor: the quantity resulting is the quotient.

Ex. $a)\,ab\,(b.\quad 2aab)\,6a^2bc-4a^2bdm\,(3ac-2dm.$

The reason of this is evident from the nature of division, and from Def. 6. *Note.* It is obvious from corollary to Prob. III. that powers of the same root are divided by subtracting their exponents.

Thus $a^2)\,a^3\,(a\quad a^3)\,a^7\,(a^4.$ Also $a^2b)\,a^3b^6\,(ab^5.$

Case II. When the divisor is simple, but not a factor of the dividend.

Rule. The quotient is expressed by a fraction, according to Def. 8. viz. by placing the dividend above a line and the divisor below it.

Thus the quotient of $3ab^2$ divided by $2mbc$ is the fraction $\dfrac{3ab^2}{2mbc}$.

Such expressions of quotients may often be reduced to a more simple form, as shall be explained in the second part of this chapter.

Case III. When the divisor is compound.

Rule.

Fundamental operations.

Rule 1. The terms of the dividend are to be ranged according to the powers of ſome one of its letters; and thoſe of the diviſor, according to the powers of the ſame letter.

Thus, if $a^2+2ab+b^2$ is the dividend, and $a+b$ the diviſor, they are ranged according to the powers of a.

2. The firſt term of the dividend is to be divided by the firſt term of the diviſor (obſerving the general rule of the ſigns); and this quotient being ſet down as a part of the quotient wanted, is to be multiplied by the whole diviſor, and the product ſubtracted from the dividend. If nothing remain, the diviſion is finiſhed: the remainder, when there is any, is a new dividend.

Thus, in the preceding example, a^2 divided by a, gives a, which is the firſt part of the quotient wanted: and the product of this part by the whole diviſor $a+b$, viz. a^2+ab being ſubtracted from the given dividend, there remains in this example $ab+b^2$.

3. Divide the firſt term of this new dividend by the firſt term of the diviſor as before, and join the quotient to the part already found, with its proper ſign: then multiply the whole diviſor by this part of the quotient, and ſubtract the product from the new dividend; and thus the operation is to be continued till no remainder is left, or till it appear that there will always be a remainder.

Thus, in the preceding example, $+ab$, the firſt term of the new dividend divided by a, gives b; the product of which, multiplied by $a+b$, being ſubtracted from $ab+b^2$, nothing remains, and $a+b$ is the true quotient. The entire operation is as follows.

$$\begin{array}{l}
a+b)\ a^2+2ab+b^2\ (a+b \\
\qquad\ \ a^2+ab \\
\hline
\qquad\qquad\ ab+b^2 \\
\qquad\qquad\ ab+b^2 \\
\hline
\qquad\qquad\quad * \ \ *
\end{array}$$

$$\begin{array}{l}
3a-b)\ 3a^3-12a^2-a^2b+10ab-2b^2\ (a^2-4a+2b \\
\qquad\quad 3a^3 \qquad\quad -a^2b \\
\hline
\qquad\quad -12a^2 \qquad +10ab \\
\qquad\quad -12a^2 \qquad +\ 4ab \\
\hline
\qquad\qquad\qquad\quad +6ab-2b^2 \\
\qquad\qquad\qquad\quad +6ab-2b^2 \\
\hline
\qquad\qquad\qquad\qquad * \quad *
\end{array}$$

$$\begin{array}{l}
1-a)\ 1\ (1+a+a^2+a^3,\ \&c. \\
\qquad\ 1-a \\
\hline
\qquad\quad +a \\
\qquad\quad +a-a^2 \\
\hline
\qquad\qquad +a^2 \\
\qquad\qquad +a^2-a^3 \\
\hline
\qquad\qquad\qquad +a^3,\ \&c.
\end{array}$$

It often happens, as in the laſt example, that there is ſtill a remainder from which the operation may be continued without end. This expreſſion of a quotient is called *an infinite ſeries*; the nature of which ſhall be conſidered afterwards. By comparing a few of the firſt terms, the law of the ſeries may be diſcovered, by which, without any more diviſion, it may be continued to any number of terms wanted.

Of the General Rule.

The reaſon of the different parts of this rule is evident; for, in the courſe of the operation, all the terms of the quotient obtained by it are multiplied by all the terms of the diviſor, and the products are ſucceſſively ſubtracted from the dividend till nothing remain: that, therefore from the nature of diviſion, muſt be the true quotient.

Note. The ſign $\div$ is ſometimes uſed to expreſs the quotient of two quantities between which it is placed: Thus, $\overline{a^2+x^2}\div\overline{a+x}$, expreſſes the quotient of a^2+x^2 divided by $a+x$.

§ 2. Of Fractions.

Definitions.

1. When a quotient is expreſſed by a fraction, the dividend above the line is called the *numerator*; and the diviſor below it is called the *denominator*.
2. If the numerator is leſs than the denominator, it is called a *proper fraction*.
3. If the numerator is not leſs than the denominator, it is called an *improper fraction*.
4. If one part of a quantity is an integer, and the other a fraction, it is called a *mixt quantity*.
5. The *reciprocal* of a fraction, is a fraction whoſe numerator is the denominator of the other; and whoſe denominator is the numerator of the other. The reciprocal of an integer is the quotient of 1 divided by that integer. Thus,
$\frac{b}{a}$ is the reciprocal of $\frac{a}{b}$; and $\frac{1}{m}$ is the reciprocal of m.

The diſtinctions in Def. 2, 3, 4, properly belong to common arithmetic, from which they are borrowed, and are ſcarcely uſed in algebra.

The operations concerning fractions are founded on the following propoſition:

If the diviſor and dividend be either both multiplied or both divided by the ſame quantity, the quotient is the ſame; or, if both the numerator and denominator of the fraction be either multiplied or divided by the ſame quantity, the value of that fraction is the ſame.

Thus, let $\frac{a}{b}=c$, then $\frac{ma}{mb}=c$. For, from the nature of diviſion, if the quotient $\frac{a}{b}$ $(=c)$ be multiplied by the diviſor b, the product muſt be the dividend a. Hence $\left(\frac{a}{b}\times b=\right)bc=a$, and likewiſe $ma=mbc$, and dividing both by mb, $\frac{ma}{mb}=c$. Converſely, if $\frac{ma}{mb}=c$, then alſo $\frac{a}{b}=c$

Cor. 1. Hence a fraction may be reduced to another of the ſame value, but of a more ſimple form, by dividing both numerator and denominator by any common meaſure.

$$\text{Thus, } \frac{30ax-54ay}{12ab}=\frac{5x-9y}{2b}.$$

$$\frac{8ab+6ac}{4a^2}=\frac{4b+3c}{2a}$$

Cor. 2. A fraction is multiplied by any integer, by multiplying the numerator, or dividing the denominator by that integer: and converſely, a fraction is divided by any integer, by dividing the numerator, or multiplying the denominator by that integer.

Prob. I. *To find the greateſt common Meaſure of two Quantities.*

1. Of pure numbers.

Rule. Divide the greater by the leſs: and, if there is no remainder, the leſs is the greateſt common meaſure required. If there is a remainder, divide the laſt diviſor by it; and thus proceed, continually dividing the laſt diviſor by its remainder, till no remainder is left, and the laſt diviſor is the greateſt common meaſure required.

The greateſt common meaſure of 45 and 63 is 9; the greateſt common meaſure of 187 and 391 is 17. Thus,

$$\begin{array}{l} 45)63(1 \\ \quad 45 \\ \quad\overline{18)45(2} \\ \qquad\ 36 \\ \qquad\ \overline{9)18(2} \\ \qquad\quad\ 18 \\ \qquad\quad\ \overline{\ 0\ } \end{array} \qquad\qquad \begin{array}{l} 187)391(2 \\ \qquad 374 \\ \qquad\overline{17)187(11} \\ \qquad\quad\ \ 187 \\ \qquad\quad\ \ \overline{\ \ *\ \ } \end{array}$$

From the nature of this operation, it is plain that it may always be continued till there be no remainder. The rule depends on the two following principles:

1. A quantity which meaſures both diviſor and remainder muſt meaſure the dividend.

2. A quantity which meaſures both diviſor and dividend muſt alſo meaſure the remainder.

For a quantity which meaſures two other quantities, muſt alſo meaſure both their ſum and difference; and, from the nature of diviſion, the dividend conſiſts of the diviſor repeated a certain number of times, together with the remainder. By the firſt it appears, that the number found by this rule is a common meaſure; and, by the ſecond, it is plain there can be no greater common meaſure: for, if there were, it muſt neceſſarily meaſure the quantity already found leſs than itſelf, which is abſurd.

When the greateſt common meaſure of algebraical quantities is required, if either of them be ſimple, any common ſimple diviſor is eaſily found by inſpection. If they are both compound, any common ſimple diviſor may alſo be found by inſpection. But, when the greateſt compound diviſor is wanted, the preceding rule is to be applied; only,

2. The ſimple diviſors of each of the quantities are to be taken out, the remainders in the ſeveral operations are alſo to be divided by their ſimple diviſors, and the quantities are always to be ranged according to the powers of the ſame letter.

The ſimple diviſors in the given quantities, or in the remainders, do not affect a compound diviſor which is wanted; and hence alſo, to make the diviſion ſucceed, any of the dividends may be multiplied by a ſimple quantity. Beſides the ſimple diviſors in the remainders not being found in the diviſors from which they ariſe, can make no part of the common meaſure ſought; and for the ſame reaſon, if in ſuch a remainder there be any compound diviſor which does not meaſure the diviſor from which it proceeds, it may be taken out.

Examples.

$$\begin{array}{r} a^2-b^2)\ a^2-2ab+b^2\ (1 \\ a^2-b^2\qquad\ \ \\ \hline -2ab+2b^2 \end{array}\ \text{Remainder which}$$

$$\text{divided by } -2b \text{ is } a-b)\ \begin{array}{l} a^2-b^2\ (a+b \\ a^2-b^2 \\ \hline \ *\ \ * \end{array}$$

If the quantities given are $8a^2b^2-10ab^3+2b^4$, and $9a^4b-9a^3b^2+3a^2b^3-3ab^4$. The ſimple diviſors being taken out, *viz.* $2b^2$ out of the firſt, it becomes $4a^2-5ab+b^2$; and $3ab$ out of the ſecond, it is $3a^3-3a^2b+ab^2-b^3$. As the latter is to be divided by the former, it muſt be multiplied by 4, to make the operation ſucceed, and then it is as follows:

$$\begin{array}{r} 4a^2-5ab+b^2)\ 12a^3-12a^2b+4ab^2-4b^3\ (3a \\ 12a^3-15a^2b+3ab^2\qquad\qquad\ \ \\ \hline 3a^2b+ab^2-4b^3\qquad\ \end{array}$$

This remainder is to be divided by b, and the new dividend multiplied by 3, to make the diviſion proceed. Thus,

$$\begin{array}{r} 3a^2+ab-4b^2)\ 12a^2-15ab+3b^2\ (4 \\ 12a^2+4ab-16b^2\quad\ \ \\ \hline -19ab+19b^2\quad\ \ \end{array}$$

and this remainder, divided by $-19b$, gives $a-b$, which being made a diviſor, divides $3a^2+ab-4b^2$ without a remainder, and therefore $a-b$ is the greateſt compound diviſor: but there is a ſimple diviſor b, and therefore $\overline{a-b}\times b$ is the greateſt common meaſure required.

Prob. II. *To reduce a Fraction to its loweſt Terms.*

Rule. Divide both numerator and denominator by their greateſt common meaſure, which may be found by prob. 1.

Thus, $\frac{75abc}{125bcx}=\frac{3a}{5x}$, $25bc$ being the greateſt common meaſure, $\frac{a^4-b^4}{a^5-a^3b^2}=\frac{a^2+b^2}{a^3}$ alſo,

$\frac{9a^4b-9a^3b^2+3a^2b^3-3ab^4}{8a^2b^2-10ab^3+2b^4}=\frac{9a^3+3ab^2}{8ab-2b^2}$ the greateſt common meaſure being $\overline{a-b}\times b$, by Prob. 1.

Prob.

Fundamental operations.

PROB. III. *To reduce an Integer to the Form of a Fraction.*

Rule. Multiply the given integer by any quantity for a numerator, and set that quantity under the product for a denominator.

Thus, $a=\frac{ma}{m}$, $a+b=\frac{a^2-b^2}{a-b}$.

Cor. Hence, in the following operations concerning fractions, an integer may be introduced; for, by this problem, it may be reduced to the form of a fraction. The denominator of an integer is generally made 1.

PROB. IV. *To reduce Fractions with different Denominators to Fractions of equal Value, that shall have the same Denominator.*

Rule. Multiply each numerator, separately taken, into all the denominators but its own, and the products shall give the new numerators. Then multiply all the denominators into one another, and the product shall give the common denominator.

Example. Let the fractions be $\frac{a}{b}, \frac{c}{d}, \frac{e}{f}$; they are respectively equal to $\frac{adf}{bdf}, \frac{bcf}{bdf}, \frac{bde}{bdf}$.

The reason of the operation appears from the preceding proposition; for the numerator and denominator of each fraction are multiplied by the same quantities; and the value of the fractions therefore is the same.

PROB. V. *To add and subtract Fractions.*

Rule. Reduce them to a common denominator, then add or subtract the numerators; and the sum or difference set over the common denominator is the sum or remainder required.

Ex. Add together $\frac{a}{b}, \frac{c}{d}, \frac{e}{f}$ the sum is $\frac{adf+cbf+bde}{bdf}$.

From $\frac{a}{b}$ subt. $\frac{c}{d}$ the difference is $\frac{ad-bc}{bd}$.

From the nature of division it is evident, that, when several quantities are to be divided by the same divisor, the sum of the quotients is the same with the quotient of the sum of the quantities divided by that common divisor.

In like manner, the difference of two fractions having the same denominator, is equal to the difference of the numerators divided by that common denominator.

Cor. 1. By Cor. Prob. 3. integers may be reduced to the form of fractions, and hence integers and fractions may be added and subtracted by this rule. Hence also what is called a mixt quantity may be reduced into the formo f a fraction, by bringing the integral part into the form of a fraction, with the same denominator as the fractional part, and adding or subtracting the numerators according as the two parts are connected by the signs + or —.

Thus, $b+\frac{c}{d}=\frac{bd+c}{d}$; and $a-\frac{a^2-b^2}{2a}=\frac{2a^2-a^2+b^2}{2a}=\frac{a^2+b^2}{2a}$.

Cor. 2. A fraction, whose numerator is a compound quantity, may be distinguished into parts, by dividing the numerator into several parts, and setting each over the original denominator, and uniting the new fractions (reduced if necessary) by the signs of their numerators.

Thus, $\frac{a^2-2ab+b^2}{2a}=\frac{a^2}{2a}-\frac{2ab}{2a}+\frac{b^2}{2a}=\frac{a}{2}-b+\frac{b^2}{2a}$.

PROB. VI. *To multiply Fractions.*

Rule. Multiply their numerators into one another, to obtain the numerator of the product; and the denominators, multiplied into one another, shall give the denominator of the product.

Ex. $\frac{a}{b}\times\frac{c}{d}=\frac{ac}{bd}$. $\frac{a+b}{c}\times\frac{a-b}{d}=\frac{a^2-b^2}{cd}$.

For, if $\frac{a}{b}$ is to be multiplied by c, the product is $\frac{ca}{b}$; but if it is to be multiplied only by $\frac{c}{d}$ the former product must be divided by d, and it becomes $\frac{ca}{bd}$ (Cor. 2. to the preceding problem.)

Or, let $\frac{a}{b}=m$, and $\frac{c}{d}=n$. Then $a=bm$, and $c=dn$, and $ac=bdmn$, and $(mn=)\frac{a}{b}\times\frac{c}{d}=\frac{ac}{bd}$.

PROB. VII. *To divide Fractions.*

Rule. Multiply the numerator of the dividend by the denominator of the divisor; their product shall give the numerator of the quotient. Then multiply the denominator of the dividend by the numerator of the divisor, and their product shall give the denominator.

Or, Multiply the dividend by the reciprocal of the divisor; the product will be the quotient wanted.

Thus, $\frac{a}{b})\frac{c}{d}(\frac{bc}{ad}=\frac{c}{d}\times\frac{b}{a}$.

For, if $\frac{c}{d}$ is to be divided by a, the quotient is $\frac{c}{da}$; but $\frac{c}{d}$ is to be divided, not by a, but by $\frac{a}{b}$; therefore the former quotient must be multiplied by b, and it is $\frac{bc}{da}$.

Or, let $\frac{a}{b}=m$, and $\frac{c}{d}=n$; then $a=bm$, and $c=dn$; also $ad=bdm$ and $bc=bdn$; therefore $\left(\frac{bdn}{bdm}=\right)\frac{n}{m}=\frac{bc}{ad}$.

Scholium.

By these problems, the four fundamental operations may be performed, when any terms of the original quantities, or of those which arise in the course of the operation, are fractional.

Ex-

Of Proportion.

Example. Mult. $\frac{a^2}{2x} - \frac{3ax}{2b}$

By $\frac{ab}{3x} - 4x$

Prod. $\frac{a^3b}{6x^2} - \frac{a^2}{2} - 2a^2 + \frac{6ax^2}{b}$

$$
\begin{array}{l}
a+x)\; a^2+x^2\; (a-x+\frac{2x^2}{a}-\frac{2x^3}{a^2}, \&c. \\
\quad a^2+ax \\
\hline
\quad -ax+x^2 \\
\quad -ax-x^2 \\
\hline
\quad\quad 2x^2 \\
\quad\quad 2x^2+\frac{2x^3}{a} \\
\hline
\quad\quad -\frac{2x^3}{a} \\
\quad\quad -\frac{2x^3}{a}-\frac{2x^4}{a^2} \\
\hline
\quad\quad\quad +\frac{2x^4}{a^2}, \&c.
\end{array}
$$

This quotient becomes a series, of which the law of continuation is obvious, without any farther operation.

In such cases, when we arrive at a remainder of one term, it is commonly set down with the divisor below it, after the other terms of the quotient, which then becomes a mixt quantity. Thus the last quotient is also expressed by $a-x+\frac{2x^2}{a+x}$

CHAP. II.

Of Proportion.

By the preceding operations quantities of the same kind may be compared together.

The relation arising from this comparison is called *ratio* or *proportion*, and is of two kinds. If we consider the difference of the two quantities, it is called *arithmetical proportion*; and if we consider their quotient, it is called *geometrical proportion*. This last being most generally useful, is commonly called simply *proportion*.

1. Of Arithmetical proportion.

Definition. When of four quantities the difference of the first and second is equal to the difference of the third and fourth, the quantities are called *arithmetical proportionals*.

Cor. Three quantities may be arithmetically proportional, by supposing the two middle terms of the four to be equal.

Prop. In four quantities arithmetically proportional, the sum of the extremes is equal to the sum of the means.

Let the four be a, b, c, d. Therefore from Def. $a-b=c-d$; to these add $b+d$ and $a+d=b+c$.

Of Proportion.

Cor. 1. Of four arithmetical proportionals, any three being given, the fourth may be found.

Thus, let a, b, c, be the 1st, 2d, and 4th terms, and let x be the third which is sought.

Then by def. $a+c=b+x$, and $x=a+c-b$.

Cor. 2. If three quantities be arithmetical proportionals, the sum of the extremes is double of the middle term; and hence, of three such proportionals, any two being given, the third may be found.

2. Of Geometrical Proportion.

Definition. If of four quantities, the quotient of the first and second is equal to the quotient of the third and fourth, these quantities are said to be in *geometrical proportion*. They are also called *proportionals*. Thus, if a, b, c, d, are the four quantities, then $\frac{a}{b}=\frac{c}{d}$, and their ratio is thus denoted $a : b :: c : d$.

Cor. Three quantities may be geometrical proportionals, viz. by supposing the two middle terms of the four to be equal. If the quantities are a, b, c, then $\frac{a}{b}=\frac{b}{c}$, and the proportion is expressed thus, $a : b : c$.

Prop. I. The product of the extremes of four quantities geometrically proportional is equal to the product of the means; and conversely.

Let $a : b :: c : d$.

Then by Def. $\frac{a}{b}=\frac{c}{d}$

and multiplying both by bd, $ad=bc$.

If $ad=bc$, then dividing by bd, $\frac{a}{b}=\frac{c}{d}$, that is, $a : b :: c : d$.

Cor. 1. The product of the extremes of three quantities, geometrically proportional, is equal to the square of the middle term.

Cor. 2. Of four quantities geometrically proportional, any three being given, the fourth may be found.

Ex. Let a, b, c, be the three first: to find the 4th. Let it be x, then $a : b :: c : x$, and by this proposition,

$$ax=bc$$

and dividing both by a, $x=\frac{bc}{a}$.

This coincides with the Rule of Three in arithmetic, and may be considered as a demonstration of it. In applying the rule to any particular case, it is only to be observed, that the quantities must be so connected and so arranged, that they be proportional, according to the preceding definition.

Cor. 3. Of three geometrical proportionals, any two being given, the third may be found.

Prop. II. If four quantities be geometrically proportional, then if any equimultiples whatever be taken of the first and third, and also any equimultiples whatever of the second and fourth; if the multiple of the first be greater than that of the second, the multiple of the third will be greater than that of the fourth; and if equal, equal; and if less, less.

For, let a, b, c, d, be the four proportionals. Of the

the first and third, ma and mc may represent any equimultiples whatever, and also nb, nd, may represent any equimultiples of the second and fourth. Since $a : b : : c : d$, $ad=bc$; and hence multiply by mn, $mnad=mnbc$, and therefore (Conv. Prop. 1.) $ma : nb : : mc : nd$; and from the definition of proportionals, it is plain, that if ma is greater than nb, mc must be greater than nd; and if equal, equal; and if less, less.

Prop. III. If four quantities are proportionals, they will also be proportionals when taken alternately or inversely, or by composition, or by division, or by conversion. See Def. 13. 14. 15. 16. 17. of Book V. of Euclid, Simson's edition.

By Prop. II. they will also be proportionals according to Def. 5. Book V. of Euclid; and therefore this proposition is demonstrated by propositions 16, B. 18, 17, E. of the same book.

Otherwise algebraically.

Let $a : b : : c : d$, and therefore $ad=bc$.

Altern.	$a : c : : b : d$
Invert.	$b : a : : d : c$
Divid.	$a-b : b : : c-d : d$
Comp.	$a+b : b : : c+d : d$
Convert.	$a : a-b : : c : c-d$

For since $ad=bc$, it is obvious, that in each of these cases the product of the extremes is equal to the product of the means; the quantities are therefore proportionals. (Prop. 1.)

Prop. IV. If four numbers be proportionals, according to Def. 5. B. V. of Euclid, they will be geometrically proportional, according to the preceding definition.

1st, Let the four numbers be integers, and let them be a, b, c, d. Then if b times a and b times c be taken, and also a times b and a times d, since ba the multiple of the first is equal to ab the multiple of the second, bc the multiple of the third, must be equal to ad the multiple of the fourth. And since $bc=ad$, by Prop. 1. a, b, c, and d, must be geometrical proportionals.

2dly, If any of the numbers be fractional, all the four being multiplied by the denominators of the fractions, they continue proportionals, according to Def. 5. B. V. Euclid (by Prop. 4. of that book); and the four integer quantities produced being such proportionals, they will be geometrical proportionals, by the first part of this prop.; and therefore, being reduced by division to their original form, they manifestly will remain proportionals, according to the algebraical definition.

CHAP. III.

SECT. I. *Of Equations in general, and of the Solution of simple Equations.*

Definitions.

1. An Equation may in general be defined to be a proposition asserting the equality of two quantities; and is expressed by placing the sign $=$ between them.
2. When a quantity stands alone upon one side of an equation, the quantities on the other side are said to be a *value* of it. Thus in the equation $x=b+y-d$, x stands alone on one side, and $b+y-d$ is a value of it.
3. When an unknown quantity is made to stand alone on one side of an equation, and there are only known quantities on the other, that equation is said to be *resolved*; and the value of the unknown quantity is called a *root* of the equation.
4. Equations containing only one unknown quantity and its powers, are divided into *orders*, according to the highest power of the unknown quantity to be found in any of its terms.

If the highest power of the unknown quantity in any term be the	1st, 2d, 3d, &c.	The Equation is called	*Simple*, *Quadratic*, *Cubic*, &c.

But the exponents of the unknown quantity are supposed to be integers, and the equation is supposed to be cleared of fractions, in which the unknown quantity, or any of its powers, enter the denominators. Thus, $x+a=\frac{3x-b}{c}$ is a simple equation; $3x-\frac{5}{2x}=12$, when cleared of the fraction by multiplying both sides by $2x$, becomes $6x^2-5=24x$ a quadratic. $x^3-2x^4=x^6-20$ is an equation of the sixth order, &c.

As the general relations of quantity which may be treated of in algebra, are almost universally either that of equality, or such as may be reduced to that of equality, the doctrine of equations becomes one of the chief branches of the science.

The most common and useful application of algebra is in the investigation of quantities that are unknown, from certain given relations to each other, and to such as are known; and hence it has been called the *analytical art*. The equations employed for expressing these relations must therefore contain one or more unknown quantities; and the principal business of this art will be, the deducing equations containing only one unknown quantity, and resolving them.

The solution of the different orders of equations will be successively explained. The preliminary rules in the following section are useful in all orders, and are alone sufficient for the solution of simple equations.

§ 1. *Of simple Equations, and their Resolution.*

Simple equations are resolved by the four fundamental operations already explained; and the application of them to this purpose is contained in the following rules.

Rule 1. Any quantity may be transposed from one side of an equation to the other, by changing its sign.

Thus, if $3x-10=2x+5$
Then, $3x-2x=10+5$ or $x=15$
Thus also, $5x+b=a+2x$
By transp. $3x=a-b$.

This rule is obvious from prob. 1. and 2.; for it is equivalent to adding equal quantities to both sides of the equation, or to subtracting equal quantities from both sides.

Cor.

Of Equations.

Cor. The signs of all the terms of an equation may be changed into the contrary signs, and it will continue to be true.

Rule 2. Any quantity by which the unknown quantity is multiplied may be taken away, by dividing all the other quantities of the equation by it.

Thus, if $ax=b$

$$x=\frac{b}{a}$$

Also, if $mx+nb=am$

$$x+\frac{nb}{m}=a$$

For if equal quantities are divided by the same quantity, the quotients are equal.

Rule 3. If a term of an equation is fractional, its denominator may be taken away, by multiplying all the other terms by it.

Thus, if $\frac{x}{a}=b+c$

$$x=ab+ac$$

Also, if $a-\frac{b}{x}=c$

$$ax-b=cx$$

And by transf. $ax-cx=b$

And by div. $x=\frac{b}{a-c}$

For if all the terms of the equation are multiplied by the same quantity, it remains a true proposition.

Corollary to the three last Rules.

If any quantity be found on both sides of the equation, with the same sign, it may be taken away from both. (Rule 1.)

Also, if all the terms in the equation are multiplied or divided by the same quantity, it may be taken out of them all. (Rule 2. and 3.)

Ex. If $3x+a=a+b$, then $3x=b$.

If $2ax+3ab=ma+a^2$, then $2x+3b=m+a$.

If $\frac{x}{3}-\frac{4}{3}=\frac{16}{3}$, then $x-4=16$.

Any simple equation may be resolved by these rules in the following manner. *1st*, Any fractions may be taken away by R. 3. *2dly*, All the terms including the unknown quantity, may be brought to one side of the equation, and the known terms to the other, by R. 1. *Lastly*, If the unknown quantity is multiplied by any known quantity, it may be made to stand alone by R. 2. and the equation will then be resolved. Def. 3.

Examples of simple Equations resolved by these Rules.

I.

If $3x+5=x+9$

R. 1. $2x=4$

R. 2. $x=\frac{4}{2}=2$

II.

If $5x-\frac{5x}{2}+12=\frac{4x}{3}+26$

R. 1. $5x-\frac{5x}{2}-\frac{4x}{3}=14$

R. 3. $30x-15x-8x=84$

Or $7x=84$

R. 2. . . $x=\frac{84}{7}=12$

III.

If $\frac{5}{x}+\frac{9}{4}=16$

R. 3. $\frac{20}{x}+9=64$

R. 3. $20+9x=64x$

R. 1. $20=55x$

R. 2. $x=\frac{20}{55}=\frac{4}{11}$

§ 2. *Solution of Questions producing simple Equations.*

From the resolution of equations we obtain the resolution of a variety of useful problems, both in pure mathematics and physics, and also in the practical arts founded upon these sciences. In this place, we consider the application of it to those questions where the quantities are expressed by numbers, and their magnitude alone is to be considered.

When an equation, containing only one unknown quantity, is deduced from the question by the following rules, it is sometimes called a *final equation*. If it be simple, it may be resolved by the preceding rules; but if it be of a superior order, it must be resolved by the rules afterwards to be explained. The examples in this chapter are so contrived, that the final equation may be simple.

The rules given in this section for the solution of questions, though they contain a reference to simple equations only, are to be considered as general, and as applicable to questions which produce equations of any order.

General Rule. The unknown quantities in the question proposed must be expressed by letters, and the relations of the known and unknown quantities contained in it, or the conditions of it, as they are called, must be expressed by equations. These equations being resolved by the rules of this science, will give the answer of the question.

For example, if the question is concerning two numbers, they may be called x and y, and the conditions from which they are to be investigated must be expressible by equations.

Thus, if it be required that the sum of two numbers sought be 60, that condition is expressed thus	$x+y=60$
If their difference must be 24, then	$x-y=24$
If their product is 1640, then	$xy=1640$
If their quotient must be 6, then	$\frac{x}{y}=6$
If their ratio is as 3 to 2, then $x:y::3:2$, and therefore	$2x=3y$

These are some of the relations which are most easily expressed. Many others occur which are less obvious; but as they cannot be described in particular rules, the algebraical expression of them is best explained by examples, and must be acquired by experience.

A

A distinct conception of the nature of the question, and of the relations of the several quantities to which it refers, will generally lead to the proper method of stating it, which in effect may be considered only as a translation from common language into that of algebra.

Case I. When there is only one unknown quantity to be found.

Rule. An equation involving the unknown quantity must be deduced from the question (by the general rule). This equation being resolved by the rules of the last section, will give the answer.

It is obvious, that, when there is only one unknown quantity, there must be only one independent equation contained in the question; for any other would be unnecessary, and might be contradictory to the former.

Examp. 1. To find a number, to which if there be added a half, a third part, and a fourth part of itself, the sum will be 50.

Let it be z: then half of it is $\frac{z}{2}$, a third of it $\frac{z}{3}$, &c.

Therefore, $z+\frac{z}{2}+\frac{z}{3}+\frac{z}{4}=50$

$$24z+12z+8z+6z=1200$$
$$50z=1200$$
$$z=24.$$

If the opertaion be more complicated, it may be useful to register the several steps of it, as in the following

Examp. 2. A trader allows L.100 *per annum* for the expences of his family, and augments yearly that part of his stock which is not so expended by a third of it; at the end of three years his original stock was doubled. What had he at first?

Let his first stock be	1	z
Of which he spends the first year L.100, and there remains	2	$z-100$
This remainder is increased by a third of itself	3	$z-100+\frac{z-100}{3}=\frac{4z-400}{3}$
The second year he spends L.100, and there remains	4	$\frac{4z-400}{3}-100=\frac{4z-700}{3}$
He increases the remainder by one-third of it	5	$\frac{4z-700}{3}+\frac{4z-700}{9}=\frac{16z-2800}{9}$
The third year he spends L.100, and there remains.	6	$\frac{16z-2800}{9}-100=\frac{16z-3700}{9}$
He increases it by one-third	7	$\frac{16z-3700}{9}+\frac{16z-3700}{27}=\frac{64z-14800}{27}$
But at the end of the third year his stock is doubled; therefore	8	$\frac{64z-14800}{27}=2z$
By R. 3.	9	$64z-14800=54z$
By R. 1.	10	$10z=14800$
By R. 2.	11	$z=1480$

Therefore his stock was L.1480; which being tried, answers the conditions of the question.

Case II. When there are two unknown quantities.

Rule. Two independent equations involving the two unknown quantities, must be derived from the question. A value of one of the unknown quantities must be derived from each of the equations: and these two values being put equal to each other, a new equation will arise, involving only one unknown quantity, and may therefore be resolved by the preceding rule.

Two equations must be deduced from the question: for, from one including two unknown quantities, it is plain, a known value of either of them cannot be obtained, more than two equations would be unnecessary; and if any third condition were assumed at pleasure, most probably it would be inconsistent with the other two, and a question containing three such conditions would be absurd.

It is to be observed, however, that the two conditions, and hence the two equations expressing them, must be independent; that is, the one must not be deducible from the other by any algebraical reasoning: for, otherwise, there would in effect be only one equation, under two different forms, from which no solution can be derived.

Examp. 3. Two persons, A and B, were talking of their ages: says A to B, Seven years ago I was just three times as old as you were, and seven years hence I shall be just twice as old as you will be. I demand their present ages.

Let the ages of A and B be respectively	1	x and y
Seven years ago they were	2	$x-7$ and $y-7$
Seven years hence they will be	3	$x+7$ and $y+7$
Therefore by Que. 1. and 2.	4	$x-7=3\times\overline{y-7}=3y-21$
Also by Quest. 2. and 3.	5	$x+7=2\times\overline{y+7}=2y+14$
By 4. and transp.	6	$x=3y-14$
By 5. and transp.	7	$x=2y+7$
By 6. and 7.	8	$3y-14=2y+7$
Transp. and 8.	9	$y=21$
By 9. and 6. or 7.	10	$x=49$

The ages of A and B then are 49 and 21, which answer the conditions.

The

The operation might have been a little shortened by subtracting the 4th from 5th, and thus $14 = -y + 35$; and hence $y = 21$. therefore (by 6th) $x = (3y - 14) = 49$.

Examp. 4. A gentleman distributing money among some poor people, found he wanted 10 s. to be able to give 5 s. to each; therefore he gives each 4 s. only and finds he has 5 s. left.—To find the number of shillings and poor people.

If any question such as this, in which there are two quantities sought, can be resolved by means of one letter, the solution is in general more simple than when two are employed. There must be, however, two independent conditions; one of which is used in the notation of one of the unknown quantities, and the other gives an equation.

Let the number of poor be	1	z
The number of shillings will be	2	$5z - 10$
The number of shillings is also	3	$4z + 5$
By 2. and 3.	4	$5z - 10 = 4z + 5$.
Transp.	5	$z = 15$.

The number of poor therefore is 15, and the number of shillings is $(4z + 5 =)$ 65, which answer the conditions.

Examp. 5. A courier sets out from a certain place, and travels at the rate of 7 miles in 5 hours; and 8 hours after, another sets out from the same place, and travels the same road, at the rate of 5 miles in 3 hours: I demand how long and how far the first must travel before he is overtaken by the second?

Let the number of hours which the first travelled be	1	y
Then the second travelled	2	$y - 8$
The first travelled seven miles in 5 hours, and therefore in y hours	3	$(5:7::y:)\ \frac{7y}{5}$ miles
In like manner the second travelled in $y-8$ hours	4	$(3:5::y-8:)\ \frac{5y-40}{3}$ miles
But they both travelled the same number of miles; therefore by 3. and 4.	5	$\frac{5y-40}{3} = \frac{7y}{5}$
Mult.	6	$25y - 200 = 21y$
Transp.	7	$4y = 200$
Divid.	8	$y = 50$

The first then travelled 50 hours, the second $(y - 8 =)$ 42 hours.

The miles travelled by each $\left(\frac{7y}{5} = \frac{5y-40}{3} = \right) 70$.

Case III. When there are three or more unknown quantities.

Rule. When there are three unknown quantities, there must be three independent equations arising from the question; and from each of these a value of one of the unknown quantities must be obtained. By comparing these three values, two equations will arise, involving only two unknown quantities, which may therefore be resolved by the rule for Case 2.

In like manner may the rule be extended to such questions as contain four or more unknown quantities; and hence it may be inferred, That, when just as many independent equations may be derived from a question as there are unknown quantities in it, these quantities may be found by the resolution of equations.

Examp. 6. To find three numbers, so that the first, with half the other two, the second with one third of the other two, and the third with one fourth of the other two, may each be equal to 34.

Let the numbers be, x, y, z, and the equations are

	1	$x + \frac{y+z}{2} = 34$
	2	$y + \frac{x+z}{3} = 34$
	3	$z + \frac{x+y}{4} = 34$
From the 1st	4	$x = \frac{68 - y - z}{2}$
From the 2d	5	$x = 102 - 3y - z$
From the 3d	6	$x = 136 - 4z - y$
From 4th and 5th	7	$\frac{68 - y - z}{2} = 102 - 3y - z$
7th reduced	8	$y = \frac{136 - z}{5}$
5=6, and reduced	9	$y = \frac{3z - 34}{2}$
8 and 9	10	$\frac{3z - 34}{2} = \frac{136 - z}{5}$
10th reduced	11	$15z - 170 = 272 - 2z$
	12	$17z = 442$ or $z = 26$
By 8 and 5	13	$y = 22$ and $x = 10$

Examp. 7. To find a number consisting of three places, whose digits are in arithmetical proportion; if this number be divided by the sum of its digits, the quotient will be 48; and if from the number be subtracted 198, the digits will be inverted.

Let the 3 digits be	1	x, y, z
Then the number is	2	$100x + 10y + z$
If the digits be inverted, it is	3	$100z + 10y + x$
The digits are in ar. prop. therefore	4	$x + z = 2y$
By question	5	$\frac{100x + 10y + z}{x + y + z} = 48$
By question	6	$100x + 10y + z - 198 = 100z + 10y + x$
From 6 and transf.	7	$99x = 99z + 198$
Divid. by 99	8	$x = z + 2$
From 4	9	$x = 2y - z$
8 and 9	10	$2y - z = z + 2$
Transp.	11	$y = z + 1$
Mult. 5	12	$100x + 10y + z = 48x + 48y + 48z$
Transp.	13	$52x = 38y + 47z$
8 and 11 substit. for x and y	14	$52z + 104 = 38z + 38 + 47z$
Transp.	15	$33z = 66$
Divid.	16	$\begin{cases} z = 2 \\ y = (z + 1 =)\ 3 \\ x = (z + 2 =)\ 4 \end{cases}$

The number then is 432, which succeeds upon trial.

It

It sometimes happens, that all the unknown quantities, when there are more than two, are not in all the equations expressing the conditions, and therefore the preceding rule cannot be literally followed. The solution, however, will be obtained by such substitutions as are used in Ex. 7. and 9. or by similar operations, which need not be particularly described.

Corollary to the preceding Rules.

It appears that, in any question, there must be as many independent equations as unknown quantities; if there are not, then the question is called *indeterminate*, because it may admit of an infinite number of answers; since the equations wanting may be assumed at pleasure. There may be other circumstances, however, to limit the answers to one, or a precise number, and which, at the same time, cannot be directly expressed by equations. Such are these, that the numbers must be integers, squares, cubes, and many others. The solution of such problems, which are also called *diophantine*, shall be considered afterwards.

Scholium.

On many occasions, by particular contrivances, the operations by the preceding rules may be much abridged. This however, must be left to the skill and practice of the learner. A few examples are the following.

1. It is often easy to employ fewer letters than there are unknown quantities, by expressing some of them from a simple relation to others contained in the conditions of the question. Thus, the solution becomes more easy and elegant. (See Ex. 4. 5.)

2. Sometimes it is convenient to express by letters, not the unknown quantities themselves, but some other quantities connected with them, as their sum, difference, &c. from which they may be easily derived. (See Ex. 1. of chap. 5.)

In the operation also, circumstances will suggest a more easy road than that pointed out by the general rules. Two of the original equations may be added together, or may be subtracted; sometimes they must be previously multiplied by some quantity, to render such addition or subtraction effectual, in exterminating one of the unknown quantities, or otherwise promoting the solution. Substitutions may be made of the values of quantities, in place of quantities themselves, and various other such contrivances may be used, which will render the solution much less complicated. (See Ex. 3. 7. and 9.)

SECT. II. *General Solution of Problems.*

In the solutions of the questions in the preceding part, the given quantities (being numbers) disappear in the last conclusion, so that no general rules for like cases can be deduced from them. But if letters are used to denote the known quantities, as well as the unknown, a general solution may be obtained, because, during the whole course of the operation, they retain their original form. Hence also the connection of the quantities will appear in such a manner as to discover the necessary limitations of the data, when there are any, which is essential to the perfect solution of a problem. From this method, too, it is easy to derive a synthetical demonstration of the solution.

When letters, or any other such symbols, are employed to express all the quantities; the algebra is sometimes called *specious* or *literal*.

Examp. 8. To find two numbers, of which the sum and difference are given.

Let s be the given sum, and d the given difference. Also, let x and y be the two numbers sought.

$$x+y=s$$
$$x-y=d$$
$$\text{Whence}\begin{cases}x=s-y\\x=d+y\end{cases}$$
$$d+y=s-y$$
$$2y=s-d$$
$$y=\frac{s-d}{2}$$
$$\text{And } x=\frac{s+d}{2}$$

Thus, let the given sum be 100, and the difference 24. Then $x=\left(\frac{s+d}{2}=\frac{124}{2}=\right)62$ & $y=\left(\frac{s-d}{2}=\frac{76}{2}=\right)38$.

In the same manner may the canon be applied to any other values of s and d. By reversing the steps in the operation, it is easy to show, that if $x=\frac{s+d}{2}$ and $y=\frac{s-d}{2}$, the sum of x and y must be s, and their difference d.

Examp. 9. If A and B together can perform a piece of work in the time a, A and C together in the time b, and B and C together in the time c, in what time will each of them perform it alone?

Let A perform the work in the time x, B in y, and C in z; then as the work is the same in all cases, it may be represented by unity.

By the question	1	$(x:1::a:)\frac{a}{x}=$	to the work performed by A in a days
	2	$(y:1::a:)\frac{a}{y}=$	B in a days
	3	$(x:1::b:)\frac{b}{x}=$	A in b days
	4	$(z:1::b:)\frac{b}{z}=$	C in b days
	5	$(y:1::c:)\frac{c}{y}=$	B in c days
	6	$(z:1::c:)\frac{c}{z}=$	C in c days
	7	$\frac{a}{x}+\frac{a}{y}=1$ and $ay+ax=xy$	
	8	$\frac{b}{x}+\frac{b}{z}=1$ and $bz+bx=xz$	
	9	$\frac{c}{y}+\frac{c}{z}=1$ and $cz+cy=zy$	
Mult. 7th by $\frac{bc}{xy}$	10	$\frac{abc}{x}+\frac{abc}{y}=bc$	
Mult. 8th by $\frac{ac}{xz}$	11	$\frac{abc}{x}+\frac{abc}{z}=ac$	
Mult. 9th by $\frac{ab}{zy}$	12	$\frac{abc}{y}+\frac{abc}{z}=ab$	
Add 10th, 11th, 12th,	13	$\frac{2abc}{x}+\frac{2abc}{y}+\frac{2abc}{z}=bc+ac+ab$	
From 13th subt. twice 10th	14	$\frac{2abc}{z}=ac+ab-bc$ & $z=\frac{2abc}{ac+ab-bc}$	
From 13th subt. twice 11th	15	$\frac{2abc}{y}=bc+ab-ac$ & $y=\frac{2abc}{bc+ab-ac}$	
From 13th subt. twice 12th	16	$\frac{2abc}{x}=bc+ac-ab$ & $x=\frac{2abc}{bc+ac-ab}$	

Example in numbers. Let $a=8$ days, $b=9$ days, and $c=10$; then $x=14\frac{34}{49}$, $y=17\frac{23}{41}$, and $z=23\frac{7}{31}$.

It appears likewise that a, b, c, must be such, that the product of any two of them must be less than the sum of these two multiplied by the third. This is necessary to give positive values of x, y, and z, which alone can take place in this question. Besides, if x, y, and z be assumed as any known numbers whatever, and if values of a, b, and c be deduced from steps 7th, 8th, and 9th, of the preceding operation, it will appear, that a, b, and c will have the property required in the limitation here mentioned.

If a, b, and c were such. that any of the quantities, x, y, and z, became equal to 0, it implies that one of the agents did nothing in the work. If the values of any of these quantities be negative, the only supposition which could give them any meaning would be, that some of the agents, instead of promoting the work, either obstructed it, or undid it to a certain extent.

Examp. 10. In question 5th, let the first courier travel p miles in q hours; the second r miles in s hours; let the interval between their setting out be a,

Then by working as formerly,

$$x=\frac{qra}{qr-ps}.$$

If particular values be inserted for these letters, a particular solution will be obtained for that case. Let them denote the numbers in Example 5.

$$\text{Then } x=\left(\frac{qra}{qr-ps}=\frac{5\times 5\times 8}{5\times 5-7\times 3}=\frac{200}{4}=\right)50.$$

Here it is obvious, that qr must be greater than ps, else the problem is impossible; for then the value of x would either be infinite or negative. This limitation appears also from the nature of the question, as the second courier must travel at a greater rate than the first, in order to overtake him. For the rate of the first courier is to the rate of the second as $\frac{p}{q}$ to $\frac{r}{s}$, that is, as ps to qr; and therefore qr must be greater than ps.

Scholium.

Sometimes when there are many known quantities in a general solution, it may simplify the operation to express certain combinations of them by new letters, still to be considered as known.

CHAP. IV.

Of Involution and Evolution.

In order to resolve equations of the higher orders, it is necessary to premise the rules of *Involution* and *Evolution*.

LEMMA.

The reciprocals of the powers of a quantity may be expressed by that quantity, with negative exponents of the same denomination. That is, the series a, 1, $\frac{1}{a}$, $\frac{1}{a^2}$, $\frac{1}{a^3}$, $\frac{1}{a^m}$, &c. may be expressed by a^1, a^0, a^{-1}, a^{-2}, a^{-3}, a^{-m}, &c.

For the rule for dividing the powers of the same root was to subtract the exponents; if then the index of the divisor be greater than that of the dividend, the index of the quotient must be negative.

Thus, $\frac{a^2}{a^3}=a^{2-3}=a^{-1}$. Also, $\frac{a^2}{a^3}=\frac{1}{a^1}$.

$\frac{a^m}{a^m}=a^{m-m}=a^0$. And, $\frac{a^m}{a^m}=1$. and so on of others.

Cor. 1. Hence any quantity which multiplies either the numerator or denominator of a fraction, may be transposed from one to the other, by changing the sign of its index.

Thus, $\frac{x}{y^2}=xy^{-2}$. And $\frac{a^2x}{y^3}=\frac{a^2}{y^3x^{-1}}$, &c.

Cor. 2. From this notation, it is evident that these *negative powers*, as they are called, are multiplied by adding, and divided by subtracting their exponents.

Thus. $a^{-2}\times a^{-3}=a^{-5}$.

Or, $\frac{1}{a^2}\times\frac{1}{a^3}=\frac{1}{a^5}=a^{-5}$.

$\frac{a^{-1}}{a^{-3}}=a^2$ Or, $\frac{1}{a^3}\Big)\frac{1}{a}\Big(\frac{a^3}{a}=a^2$

Of Involution and Evolution.

I. *Of Involution.*

To find any power of any quantity is the bufinefs of involution.

Cafe 1. When the quantity is fimple.

Rule. Multiply the exponents of the letters by the index of the power required, and raife the coefficient to the fame power.

Thus, the 2d power of a is $a^{1\times 2}=a^2$
The 3d power of $2a^2$ is $8a^{2\times 3}=8a^6$
The 3d power of $3ab^3$ is $27a^{1\times 3}b^{3\times 3}=27a^3b^9$.

For the multiplication would be performed by the continued addition of the exponents; and this multiplication of them is equivalent. The fame rule holds alfo when the figns of the exponents are negative.

Rule for the figns. If the fign of the given quantity is $+$, all its powers muft be pofitive. If the fign is $-$, then all its powers whofe exponents are even numbers are pofitive; and all its powers whofe exponents are odd numbers are negative.

This is obvious from the rule for the figns in multiplication.

The laft part of it implies the moft extenfive ufe of the figns $+$ and $-$, by fuppofing that a negative qnantity may exift by itfelf.

Cafe 2. When the quantity is compound.

Rule. The powers muft be found by a continual multiplication of it by itfelf.

Thus, the fquare of $x+\frac{a}{2}$ is found by multiplying it into itfelf. The product is $x^2+ax+\frac{a^2}{4}$ The cube of $x+\frac{a}{2}$ is got by multiplying the fquare already found by the root, &c.

Fractions are raifed to any power, by raifing both numerator and denominator to that power, as is evident for the rule for multiplying fractions in Chap. I. § 2.

The involution of compound quantities is rendered much eafier by the binominal theorem; for which fee Chap. VI.

Note. The fquare ot a binominal confifts of the fquares of two parts, and twice the product of the two parts.

II. *Of Evolution.*

Evolution is the reverfe of involution, and by it powers are refolved into their roots.

Def. The root of any quantity is expreffed by placing before it $\sqrt{}$ (called a *radical fign*) with a fmall figure above it, denoting the denomination of that root.

Thus, the fquare root of a, is $\sqrt[2]{a}$ or $\sqrt{a}$

The cube root of bc, is $\sqrt[3]{bc}$

The 4th root of a^2b-x^3, is $\sqrt[4]{a^2b-x^3}$

The mth root of c^2-dx, is $\sqrt[m]{c^2-dx}$

General Rule for the Signs.

1. The root of any pofitive power may be either pofitive or negative, if it is denominated by an even number; if the root is denominated by an odd number, it is pofitive only.
2. If the power is negative, the root alfo is negative, when it is denominated by an odd number.
3. If the power is negative, and the denomination of the root even, then no root can be affigned.

This rule is eafily deduced from that given in involution, and fuppofes the fame extenfive ufe of the figns $+$ and $-$. If it is applied to abftract quantities in which a contrariety cannot be fuppofed, any root of a pofitive quantity muft be pofitive only; and any root of a negative quantity, like itfelf, is unintelligible.

In the laft cafe, though no root can be affigned, yet fometimes it is convenient to fet the radical fign before the negative quantity, and then it is called an *impoffible* or *imaginary* root.

The root of a pofitive power, denominated by an even number, has often the fign $\pm$ before it, denoting that it may have either $+$ or $-$.

The radical fign may be employed to exprefs any root of any quantity whatever; but fometimes the root may be accurately found by the following rules; and when it cannot, it may often be more conveniently expreffed by the methods now to be explained.

Cafe I. When the quantity is fimple.

Rule. Divide the exponents of the letters by the index of the root required, and prefix the root of the numeral coefficient.

1. The exponents of the letters may be multiples of the index of the root, and the root of the coefficient may be extracted.

Thus, the fquare root of $a^4=a^{\frac{4}{2}}=\pm a^2$

$$\sqrt[3]{27a^6}=3a^{\frac{6}{3}}=3a^2$$

$$\sqrt[4]{a^4b^{12}}=a^{\frac{4}{4}}b^{\frac{12}{4}}=\pm ab^3.$$

2. The exponents of the letters may not be multiples of the index of the root, and then they become fractions; and when the root of the coefficient cannot be extracted, it may alfo be expreffed by a fractional exponent, its original index being underftood to be 1.

Thus, $\sqrt{16a^3b^2}=4a^{\frac{3}{2}}b$

$$\sqrt[3]{7ax^3}=7^{\frac{1}{3}}a^{\frac{1}{3}}x=\sqrt[3]{7}\times a^{\frac{1}{3}}x.$$

As evolution is the reverfe of involution, the reafon of the rule is evident.

The root of any fraction is found by extracting that root out of both numerator and denominator.

Cafe II. When the quantity is compound.

1. To extract the fquare root.

Rule. 1. The given quantity is to be ranged according to the powers of the letters, as in divifion.

Thus,

Of Involution and Evolution.

Thus, in the example $a^2+2ab+b^2$, the quantities are ranged in this manner.

2. The square root is to be extracted out of the first term (by preceding rules), which gives the first part of the root sought. Subtract its square from the given quantity, and divide the first term of the remainder by double the part already found, and the quotient is the second term of the root.

Thus, in this example, the remainder is $2ab+b^2$; and $2ab$ being divided by $2a$, the double of the part found, gives $+b$ for the second part of the root.

3. Add this second part to double of the first, and multiply their sum by the second part: Subtract the product from the last remainder, and if nothing remain, the square root is obtained. But, if there is a remainder, it must be divided by the double of the parts already found, and the quotient would give the third part of the root; and so on.

In the last example, it is obvious, that $a+b$ is the square root sought.

The entire operation is as follows.

$$\begin{array}{ll}
 & a^2+2ab+b^2\,(a+b \\
 & a^2 \\
\hline
2a+b) & +2ab+b^2 \\
\times b) & 2ab+b^2 \\
\hline
 & *
\end{array}$$

$$\begin{array}{ll}
 & x^4-ax^2+\frac{a^2}{4}\left(x^2-\frac{a}{2}\right. \\
 & x^4 \\
\hline
2x^2-\frac{a}{2}) & -ax^2+\frac{a^2}{4} \\
\times -\frac{a}{2}) & -ax^2+\frac{a^2}{4} \\
\hline
 & *
\end{array}$$

The reason of this rule appears from the composition of a square.

2. To extract any other root.

Rule. Range the quantity according to the dimensions of its letters, and extract the said root out of the first term, and that shall be the first member of the root required. Then raise this root to a dimension lower by unity than the number that denominates the root required, and multiply the power that arises by that number itself. Divide the second term of the given quantity by the product, and the quotient shall give the second member of the root required.—In like manner are the other parts to be found, by considering those already got as making one term.

Thus, the fifth root of

$$\begin{array}{ll}
 & a^5+5a^4b+10a^3b^2+10a^2b^3+5ab^4+b^5\,(a+b \\
 & a^5 \\
\hline
5a^4 &)\,5a^4b
\end{array}$$

And $a+b$ raised to the 5th power is the given quantity, and therefore it is the root sought.

In evolution it will often happen, that the operation will not terminate, and the root will be expressed by a series.

Thus, the square root of a^2+x^2 becomes a series.

$$\begin{array}{ll}
 & a^2+x^2\left(a+\frac{x^2}{2a}-\frac{x^4}{8a^3}+\frac{x^6}{16a^5}, \text{\&c.}\right. \\
 & a^2 \\
\hline
2a+\frac{x^2}{2a}) & *+x^2 \\
\times\frac{x^2}{2a}) & =x^2+\frac{x^4}{4a^2} \\
\hline
2a+\frac{x^2}{a}-\frac{x^4}{8a^3}) & *-\frac{x^4}{4a^2} \\
\times-\frac{x^4}{8a^3}) & =-\frac{x^4}{4a^2}-\frac{x^6}{8a^4}+\frac{x^8}{64a^6} \\
\hline
 & *+\frac{x^6}{8a^4}-\frac{x^8}{64a^6}, \text{\&c.}
\end{array}$$

The extraction of roots by series is much facilitated by the binomial theorem (Chap. vi. Sect. 3.) By similar rules, founded on the same principles, are the roots of numbers to be extracted.

III. *Of Surds.*

Def. Quantities with fractional exponents are called *surds*, or *imperfect powers*.

Such quantities are also called *irrational*; in opposition to others with integral exponents, which are called *rational*.

Surds may be expressed either by the fractional exponents, or by the radical sign, the denominator of the fraction being its index; and hence the orders of surds are denominated from this index.

In the following operations, however, it is generally convenient to use the notation by the fractional exponents.

$$a^{\frac{1}{3}}=\sqrt[3]{a}.\quad \sqrt{4ab^2}=2ba^{\frac{1}{2}}.\quad \sqrt[4]{a^3b^2}=a^{\frac{3}{4}}b^{\frac{2}{4}}.$$

The operations concerning surds depend on the following principle: If the numerator and denominator of a fractional exponent be both multiplied or both divided by the same quantity, the value of the power is the same. Thus $a^{\frac{m}{n}}=a^{\frac{mc}{nc}}$: for let $a^{\frac{m}{n}}=b$; then $a^m=b^n$, and $a^{mc}=b^{nc}$, and extracting the root nc, $a^{\frac{mc}{cn}}=b^{\frac{nc}{nc}}=b=a^{\frac{m}{n}}$.

Lem. A rational quantity may be put into the form of a surd, by reducing its index to the form of a fraction of the same value.

$$\text{Thus } a=a^{\frac{2}{2}}=\sqrt{a^2}$$
$$a^2b=a^{\frac{6}{3}}b^{\frac{3}{3}}=\sqrt[3]{a^6b^3}.$$

PROB. I. *To reduce surds of different denominations to others of the same value and of the same denomination.*

Rule.

Rule. Reduce the fractional exponents to others of the same value and having the same common denominator.

Ex. $\sqrt{a}$, $\sqrt[3]{b^2}$ or $a^{\frac{1}{2}}$, $b^{\frac{2}{3}}$

but $a^{\frac{1}{2}} = a^{\frac{3}{6}}$ and $b^{\frac{2}{3}} = b^{\frac{4}{6}}$.

therefore $\sqrt{a}$, and $\sqrt[3]{b^2}$ are respectively equal to $\sqrt[6]{a^3}$ and $\sqrt[6]{b^4}$

PROB. II. *To multiply and divide surds.*

1. When they are surds of the same rational quantity, add and subtract their exponents.

Thus, $a^{\frac{1}{3}} \times a^{\frac{3}{4}} = a^{\frac{1}{3} + \frac{3}{4}} = a^{\frac{13}{12}} = \sqrt[12]{a^{13}}$

$$\frac{\sqrt{a^2-b^2}}{\sqrt[3]{a^2-b^2}} = \frac{\overline{a^2-b^2}|^{\frac{1}{2}}}{\overline{a-b^2}|^{\frac{1}{3}}} = \overline{a^2-b^2}|^{\frac{1}{6}} = \sqrt[6]{a^2-b^2}.$$

2. If they are surds of different rational quantities, let them be brought to others of the same denomination, if already they are not, by prob. 1. Then, by multiplying or dividing these rational quantities, their product or quotient may be set under the common radical sign.

Thus, $\sqrt[m]{a} \times \sqrt[n]{b} = a^{\frac{1}{m}} b^{\frac{1}{n}} = \sqrt[mn]{a^n b^m}$

$$\frac{\sqrt{a^2-b^2}}{\sqrt{a+b}} = \sqrt{\frac{a^2-b^2}{a+b}} = \sqrt{a-b}.$$

$$\frac{\sqrt[4]{a^3 b^2}}{\sqrt[3]{a^2 b}} = \frac{a^{\frac{3}{4}} b^{\frac{3}{4}}}{a^{\frac{2}{3}} b^{\frac{1}{3}}} = a^{\frac{3}{4} - \frac{2}{3}} b^{\frac{1}{2} - \frac{1}{3}} = a^{\frac{1}{12}} b^{\frac{1}{6}} =$$

$$a^{\frac{1}{12}} b^{\frac{3}{12}} = \sqrt[12]{ab^2}$$

If the surds have any rational coefficients, their product or quotient must be prefixed. Thus, $a\sqrt{m} \times b\sqrt{n} = ab\sqrt{mn}$. It is often convenient, in the operations of this problem, not to bring the surds of simple quantities to the same denomination, but to express their product or quotient without the radical sign, in the same manner as if they were rational quantities. Thus, the product in Ex. 1. may be $a^{\frac{1}{m}} b^{\frac{1}{n}}$, and the quotient in Ex. 3. $a^{\frac{1}{12}} b^{\frac{1}{6}}$

Cor. If a rational coefficient be prefixed to a radical sign, it may be reduced to the form of a surd by the lemma, and multiplied by this problem; and conversely, if the quantity under the radical sign be divisible by a perfect power of the same denomination, it may be taken out, and its root prefixed as a coefficient.

$$a\sqrt{b} = \sqrt{a^2 b}\,;\; 2 \times \sqrt[3]{a} = \sqrt[3]{8a}.$$

Conv. $\sqrt{a^2 b^3} = ab\sqrt{b}$; $\sqrt{4a^2 - 8a^2 b} = 2a\sqrt{1-2b}$.

Even when the quantity under the radical sign is not divisible by a perfect power, it may be useful sometimes to divide surds into their component factors, by reversing the operation of this problem.

Thus $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$, $\sqrt[3]{a^2 b - bx^2} = \sqrt[3]{ba - bx} \times \sqrt[3]{a+x} = b^{\frac{1}{3}} \times \sqrt[3]{a-x} \times \sqrt[3]{a+x}$.

PROB. III. *To involve or evolve Surds.*

This is performed by the same rules as in other quantities, by multiplying or dividing their exponents by the index of the power or root required.

The notation by negative exponents, mentioned in the lemma at the beginning of this chapter, is applicable to fractional exponents, in the same manner as to integers.

Scholium.

The application of the rules of this chapter to the resolving of equations, shall be explained in the succeeding chapters, which treat of the solution of the different classes of them; but some examples of their use in preparing equations for a solution are the following.

If a member of an equation be a surd root, then the equation may be freed from any surd, by bringing that member first to stand alone upon one side of the equation, and then taking away the radical sign from it, and raising the other side to the power denominated by the index of that surd.

This operation becomes a necessary step towards the solution of an equation, when any of the unknown quantities are under the radical sign.

Example. If $3\sqrt{x^2-a^2} + 2y = a + y$
Then $3\sqrt{x^2-a^2} = a - y$
and $9 \times \overline{x^2 - a^2} = a^2 - 2ay + y^2$

If the unknown quantity be found only under the radical sign, and only of the first dimension, the equation will become simple, and may be resolved by the preceding rules.

Thus, if $\sqrt[3]{4x+16} + 5 = 9$
Then $\sqrt[3]{4x+16} = 4$
And $4x + 16 = 64$
$4x = 48$
And $x = 12$

If $\sqrt[m]{a^2 x - b^2 x} = a$
Then $a^2 x - b^2 x = a^m$

$$x = \frac{a^m}{a^2 - b^2}$$

If the unknown quantity in a final equation has fractional exponents, by means of the preceding rules a new equation may be substituted, in which the exponents of the unknown quantity are integers.

Thus, if $x^{\frac{1}{2}} + 3x^{\frac{2}{3}} = 10$, by reducing the surds to the same denomination, it becomes $x^{\frac{3}{6}} + 3x^{\frac{4}{6}} = 10$; and if $z = x^{\frac{1}{6}}$, then $z^3 + 3z^4 = 10$; and if this equation be resolved from a value of z, a value of x may be got by the rules of the next chapter. Thus also, if $x + 2x^{\frac{1}{2}} - 3x^{\frac{1}{3}} = 100$. If $x^{\frac{1}{6}} = z$, this equation becomes $z^6 + 2z^3 - 3z^2 = 100$.

In general, if $x^{\frac{p}{q}} + x^{\frac{m}{n}} = a$. by reducing the surds to the same denomination $x^{\frac{pn}{nq}} + x^{\frac{qm}{qn}} = a$, and if $x^{\frac{1}{qn}} = z$, then the equation is $z^{pn} + z^{qm} = a$, in which the

the exponents of z are integers; and z being found, x is to be found from the equation $x^{\frac{1}{qn}}=z$.

CHAP. V.

Equations were divided into orders according to the higheſt index of the unknown quantity in any term. (chap. 3.)

Equations are either *pure* or *adfected*.

Def. 1. A *pure equation* is that in which only one power of the unknown quantity is found.

2. An *adfected equation*, is that in which different powers of the unknown quantity are found in the ſeveral terms.

Thus, $a^2+ax^2=b^3$, $ax^2-b^2=m^2+x^2$ are pure equations.

And $x^2-ax=b$, $x^3+x^2=17$, are adfected.

1. *Solution of pure Equations.*

Rule. Make the power of the unknown quantity to ſtand alone by the rules formerly given, and then extract the root of the ſame denomination out of both ſides, which will give the value of the unknown quantity.

EXAMPLES.

If $a^2+ax^2=b^3$

$ax^2=b^3-a^2$

$$x^2=\frac{b^3-a^2}{a}$$

$$x=\sqrt{\frac{b^3-a^2}{a}}$$

$ax^m-b=x^m-c$

$ax^m-x^m=b-c$

$$x^m=\frac{b-c}{a-1}$$

$$x=\sqrt[m]{\frac{b-c}{a-1}}$$

The index of the power may alſo be fractional; as in the laſt example m may be any number whatever. Let $m=\frac{1}{2}$, then as before,

$$x^m=x^{\frac{1}{2}}=\frac{b-c}{a-1}$$

$$\text{And } x=\overline{\frac{b-c}{a-1}}\Big|^2=\frac{b^2-2bc+c^2}{a^2-2a+1}.$$

Sometimes different powers of the unknown quantity are found in the equation, yet the ſeveral terms may form on one ſide a perfect power, of which the root being extracted, the equation will become ſimple.

Thus, if $x^3-12x^2+48x=98$, it is eaſy to obſerve that $x^3-12x^2+48x-64=34$; forming a complete cube; of which the root being extracted, $x-4=\sqrt[3]{34}$. And $x=4+\sqrt[3]{34}$.

Examp. 1. To find four continued proportionals, of which the ſum of the extremes is 56, and the ſum of the means 24.

To reſolve the queſtion in general terms, let the ſum of the extremes be a, the ſum of the means b, and let the difference of the extremes be called z, and the difference of the means y.

Then by Ex. 8. chap. 3.

The proportionals are	1	$\frac{a+z}{2}:\frac{b+y}{2}:\frac{b-y}{2}:\frac{a-z}{2}$.
Mult. by 2 and ſtill	2	$a+z:b+y:b-y:a-z$
From the three firſt	3	$ab-ay+bz-zy=b^2+2by+y^3$
From the three laſt	4	$ab+ay-bz-zy=b^2-2by+y^2$
3d added to 4th	5	$2ab-2zy=2b^2+2y^2$
4th ſubt. from 3d	6	$2bz-2ay=4by$
6th reduced	7	$z=\frac{2by+ay}{b}$
7th ſnbſt. for z in 5th	8	$2ab-2\times\frac{2by^2+ay^2}{b}=2b^2+2y^2$
Tranſp. and divide 8th by $\frac{2}{b}$	9	$ab^2-b^3=3by^2+ay^2$
	10	$\frac{ab^2-b^3}{3b+a}=y^2$ and $y=\sqrt{\frac{ab^2-b^3}{3b+a}}$
In numbers	11	$y=\sqrt{\frac{ab^2-b^3}{3b+a}}=b\sqrt{\frac{a-b}{3b+a}}=24\sqrt{\frac{32}{128}}=12$
	12	$z=\frac{2b+a}{b}\times y=52$

Hence the four proportionals ars 54, 18, 6, 2; and it appears that b muſt be greater than a, otherwiſe the root becomes impoſſible, and the problem would alſo be impoſſible; which limitation might be deduced alſo from prop. 25. V. of Euclid.

2. *Solution of adfected Quadratic Equations.*

Adfected equations of different orders are reſolved by different rules, ſucceſſively to be explained.

An adfected quadratic equation (commonly called a quadratic) involves the unknown quantity itſelf, and alſo its ſquare: It may be reſolved by the following

Rule. 1. Tranſpoſe all the terms involving the unknown quantity to one ſide, and the known terms to the other; and ſo that the term containing the ſquare of the unknown quantity may be poſitive.

2. If the ſquare of the unknown quantity is multiplied by any coefficient, all the terms of the equation are to be divided by it, ſo that the coefficient of the ſquare of the unknown quantity may be 1.

3. Add to both ſides the ſquare of half the coefficient of the unknown quantity itſelf, and the ſide of the equation involving the unknown quantity will be a complete ſquare.

4. Extract

4. Extract the square root from both sides of the equation, by which it becomes simple, and by transposing the abovementioned half coefficient, a value of the unknown quantity is obtained in known terms, and therefore the equation is resolved.

The reason of this rule is manifest from the composition of the square of a binomial, for it consists of the squares of the two parts, and twice the product of the two parts. (*Note*, at the end of Chap. IV.)

The different forms of quadratic equations, expressed in general terms, being reduced by the first and second parts of the rule, are these;

1. $x^2+ax=b^2$
2. $x^2-ax=b^2$
3. $x^2-ax=-b^2$

Case 1. $x^2+ax=b^2$

$$x^2+ax+\frac{a^2}{4}=b^2+\frac{a^2}{4}$$
$$x+\frac{a}{2}=\pm\sqrt{b^2+\frac{a^2}{4}}$$
$$x=\pm\sqrt{b^2+\frac{a^2}{4}}-\frac{a}{2}$$

Case 2. $x^2-ax=b^2$

$$x^2-ax+\frac{a^2}{4}=b^2+\frac{a^2}{4}$$
$$x-\frac{a}{2}=\pm\sqrt{b^2+\frac{a^2}{4}}$$
$$x=\frac{a}{2}\pm\sqrt{b^2+\frac{a^2}{4}}$$

Case 3. $x^2-ax=-b^2$

$$x^2-ax+\frac{a^2}{4}=\frac{a^2}{4}-b^2$$
$$x-\frac{a}{2}=\pm\sqrt{\frac{a^2}{4}-b^2}$$
$$x=\frac{a}{2}\pm\sqrt{\frac{a^2}{4}-b^2}.$$

Of these cases it may be observed,

1. That if it be supposed, that the square root of a positive quantity may be either positive or negative, according to the most extensive use of the signs, every quadratic equation will have two roots, except such of the third form, whose roots become impossible.

2. It is obvious, that, in the two first forms, one of the roots must be positive, and the other negative.

3. In the third form, if $\frac{a^2}{4}$, or the square of half the coefficient of the unknown quantity, be greater than b^2, the known quantity, the two roots will be positive. If $\frac{a^2}{4}$ be equal to b^2, the two roots then become equal.

But if in this third case $\frac{a^2}{4}$ is less than b^2, the quantity under the radical sign becomes negative, and the two roots are therefore impossible. This may be easily shown to arise from an impossible supposition in the original equation.

4. If the equation, however, express the relation of magnitudes abstractly considered, where a contrariety cannot by supposed to take place, the negative roots cannot be of use, or rather there are no such roots; for then a negative quantity by itself is unintelligible, and therefore the square root of a positive quantity must be positive only. Hence, in the two first cases, there will be only one root; but in the third, there will be two. For in this third case, $x^2-ax=-b^2$, or $ax-x^2=b^2$, it is obvious that x may be either greater or less than $\frac{1}{2}a$, and yet ax may be positive, and hence $\overline{a-x}\times x=ax-x^2$ may also be positive, and may be equal to a given positive quantity b^2: therefore the square root of $x^2-ax+\frac{1}{4}a^2$ may be either $x-\frac{1}{2}a$ or $\frac{1}{2}a-x$, and both these quantities also positive.

Let then $x-\frac{a}{2}=\sqrt{\frac{a^2}{4}-b^2}$ and $x=\frac{a}{2}+\sqrt{\frac{a^2}{4}-b^2}$. Also let $\frac{a}{2}-x=\sqrt{\frac{a^2}{4}-b^2}$; and hence $x=\frac{a}{2}-\sqrt{\frac{a^2}{4}-b^2}$, and these are the same two positive roots as were obtained by the general rule.

The general rule is usually employed, even in questions where negative numbers cannot take place, and then the negative roots of the two first forms are neglected. Sometimes one only even of the positive roots of the third case can be used, and the other may be excluded by a particular condition in the question. When an impossible root arises in the solution of a question, and if it be resolved in general terms, the necessary limitation of the data will be discovered.

When a question can be so stated as to produce a pure equation, it is generally to be preferred to an affected. Thus the question in the preceding section, by the most obvious notation, would produce an affected equation.

2. *Solution of Questions producing Quadratic Equations.*

The expression of the conditions of the question by equations, or the stating of it, and the reduction likewise of these equations, till we arrive at a quadratic equation, involving only one unknown quantity and its square, are effected by the same rules which were given for the solution of simple equations in Chap III.

Examp. 2. One lays out a certain sum of money in goods, which he sold again for L.24, and gained as much per cent. as the goods cost him: I demand what they cost him?

If the money laid out be	1	y
The gain will be	2	$24-y$
But this gain is ($y:24-y::100:$)	3	$\frac{2400-100y}{y}$ per cent.
Therefore by question	4	$y=\frac{2400-100y}{y}$
And by mult. and tr.	5	$y^2+100y=2400$
Completing the square	6	$y^2+100y+50^2=2400+2500=4900$
Extr. the root	7	$y+50=\pm\sqrt{4900}=70$
Transp.	8	$y=\pm70-50=20$ or -120.

The answer is 20l. which succeeds. The other root, -120, has no place in this example, a negative number being here unintelligible.

Any quadratic equation may be resolved also by the general canons at the beginning of this section. That arising

Equations.

arising from this question, (No. 5.) belongs to Case I. and $a=100$, $b^2=2400$; therefore,

$$y=\left(-\frac{a}{2}\mp\sqrt{\frac{a^2}{4}+b^2}=\right)-\frac{100}{2}\pm\sqrt{\frac{100^2}{4}+2400}=20 \text{ or } -120 \text{ as before.}$$

Examp. 3. What two numbers are those, whose difference is 15, and half of whose product is equal to the cube of the lesser?

Let the lesser number be	1	x
The greater is	2	$x+15$
By question	3	$\frac{x^2+15x}{2}=x^3$
Divide by x and mult. by 2.	4	$x+15=2x^2$
4th prepared	5	$x^2-\frac{x}{2}=\frac{15}{2}$
Complete square	6	$x^2-\frac{x}{2}+\frac{1}{16}=\frac{15}{2}+\frac{1}{16}=\frac{121}{16}$
Ext. $\surd$.	7	$x-\frac{1}{4}=\pm\frac{11}{4}$
Transp.	8	$x=3$ or $-\frac{5}{2}$

The numbers therefore are 3 and 18, which answer the conditions. This is an example of Case 2d, and the negative root is neglected.

A solution, indeed, may be represented by means of the negative root $-\frac{5}{2}$; for then the other number is $x+15=)-\frac{5}{2}+15=\frac{25}{2}$. And $\frac{1}{2}\times\frac{25}{2}\times-\frac{5}{2}$, is equal to the cube of $-\frac{5}{2}$. Such a solution, though useless, and even absurd, it is plain must correspond to the conditions, if those rules with regard to the signs be used in the application of it, by which it was itself deduced. The same observation may be extended even to impossible roots; which being assumed as the answer of a question, must, by reversing the steps of the investigation, correspond to the original equations, by which the conditions of that question were expressed.

Examp. 4. To find two numbers whose sum is 100, and whose product is 2059.

Let the given sum $100=a$, the product $2059=b$, and let one of the numbers sought be x, the other will be $a-x$. Their product is $ax-x^2$.

Therefore by question	1	$ax-x^2=b$ or $x^2-ax=-b$
Complete the square	2	$x^2-ax+\frac{a^2}{4}=\frac{a^2}{4}-b$
Ext. $\surd$	3	$x-\frac{a}{2}=\pm\sqrt{\frac{a^2}{4}-b}$
Transp.	4	$x=\frac{a}{2}\pm\sqrt{\frac{a^2}{4}-b}$
And the other number	5	$a-x=\frac{a}{2}\mp\sqrt{\frac{a^2}{4}-b}$

By inserting numbers, $x=71$ or 29 and $a-x=29$ or 71, so that the two numbers sought are 71 and 29.

Equations.

Here it is to be observed, that b must not be greater than $\frac{a^2}{4}$, else the roots of the equation would be impossible; that is, the given product must not be greater than the square of half the given sum of the numbers sought. This limitation can easily be shown from other principles; for, the greatest possible product of two parts, into which any number may be divided, is when each of them is a half of it. If b be equal to $\frac{a^2}{4}$, there is only one solution, and $x=\frac{a}{2}$, also $a-x=\frac{a}{2}$.

Examp. 5. There are three numbers in continual geometrical proportion: The sum of the first and second is 10, and the difference of the second and third is 24. What are the numbers?

Let the first be	1	z
The second will be	2	$10-z$
And the third	3	$34-z$
Since $z:10-z::10-z:34-z$	4	$z^2-20z+100=34z-z^2$
Transp.	5	$2z^2-54z=-100$
Divid.	6	$z^2-27z=-50$
Compl. the square	7	$z^2-27z+\left(\frac{27}{2}\right)^2=\frac{729}{4}-50=\frac{529}{4}$
Extract the $\surd$	8	$z-\frac{27}{2}=\pm\sqrt{\frac{529}{4}}=\pm\frac{23}{2}$
Transp.	9	$z=\frac{27}{2}\pm\frac{23}{2}=25$ or 2.

But though there are two positive roots in this equation, yet one of them only can here be of use, the other being excluded by a condition in the question. For as the sum of the first and second is 10, 25 cannot be one of them: 2 therefore is the first, and the proportionals will be 2, 8, 32.

This restriction will also appear from the explanation given of the third form, to which this equation belongs. For z may be less than $\frac{27}{2}$, but from the first condition of the question it cannot be greater; hence the quantity $z^2-27z+\left(\frac{27}{2}\right)^2$ can have only one square root, viz. $\frac{27}{2}-z$; and this being put equal to $\sqrt{\frac{529}{4}}$, we have by transposition $z=\frac{27}{2}-\frac{23}{2}=2$, which gives the only just solution of the question.

From the other root, indeed, a solution of the question may be represented by means of a negative quantity. If the first then be 25, the three proportionals will be 25, -15, 9. These also must answer the conditions, according to the rules given for negative quantities, though such a solution has no proper meaning.

Besides, it is to be observed, that if the following question be proposed, 'To find three numbers in geometrical proportion, so that the difference of the 1st and

and 2d may be 10, and the sum of the 2d and 3d may be 24,' the equation in step 6th will be produced; for, if the 1st be z, the second is $z-10$, and the third $34-z$, and therefore $34z-z^2=z^2-20z+100$, the very same equation as in step 4th. In this question it is plain that the root 25 only can be useful, and the three proportionals are 25, 15, 9.

But the necessary limitations of such a problem are properly to be derived from a general notation. Let the sum of the two first proportionals be a, and the difference of the two last b. If a is not greater than b, the first term must be the least; but if a be greater than b, the first term must be either the greatest or the least.

When the first term is the least, the proper notation of the three terms is z, $a-z$, $a+b-z$, and the equation when ordered is $z^2-\frac{3a+b}{2}z=-\frac{a^2}{2}$. If the first term be the greatest, and then a is greater than b, the notation of the terms is z, $a-z$, $a-b-z$, and the corresponding equation is $z^2-\frac{3a-bz}{2}=-\frac{a^2}{2}$.

Of the first of these equations it may be observed, that whatever be the value of a and b, the square of $\frac{3a+b}{4}$, viz. of half the coefficient of z, is greater than $\frac{a^2}{2}$, and therefore the roots are always possible. If the square be completed, and the roots extracted, they become $z-\frac{3a+b}{4}=\frac{\sqrt{\overline{3a+b}|^2-8a^2}}{4}$, and $\frac{3a+b}{4}-z=\frac{\sqrt{\overline{3a+b}|^2-8a^2}}{4}$. But in this case z is the least of the three terms, and therefore a is greater than $2z$, or $\frac{a}{2}$ is greater than z; much more then is $\frac{3a+b}{4}$ greater than z; and therefore the second root only can be admitted, and $z=\frac{3a+b-\sqrt{\overline{3a+b}|^2-8a^2}}{4}$ is the only proper solution.

In the second equation, since a is greater than b, $\frac{3a-b}{2}$ must be always positive, and therefore the equation is necessarily of the third form. But the roots are possible only when $\overline{\frac{3a-b}{4}}\Big|^2$ is not less than $\frac{a^2}{2}$, that is, when a^2+b^2 is not less than $6ab$, or when $a-b$ is not less than $2\sqrt{ab}$. When the roots are possible, z may be either greater or less than $\frac{3a-b}{4}$, and hence each root gives a proper solution; therefore, $z=\frac{3a-b\pm\sqrt{\overline{3a-b}|^2-8a^2}}{4}$.

Ex. Let $a=40$ and $b=6$. The first term in this case may be assumed either as the greatest or the least. And, first, if z be the greatest, the roots of the equation will be possible, since $(a^2+b^2=)$ 1636 is greater than $(6ab=)$ 1440. The two values of z are 32 and 25, and the proportionals are either 32, 8, 2, or 25, 15, 9. 2*dly*, If z be assumed the least of the proportionals, the two roots of the equation are possible, but one of them only can be applied; which is 17.635 nearly; and the three proportionals are 17.635, 22.365, and 28.365, nearly, the roots of the equation being incommensurate.

In like manner may the limitations of the other question abovementioned be ascertained.

Though the preceding questions have been so contrived that the answers may be integers, yet in practice it will most commonly happen that they must be surds. When in any question the root of a number which is not a perfect square is to be extracted, it may be continued in decimals, by the common arithmetical rule, to any degree of accuracy which the nature of the subject may require.

Scholium.

An equation, in the terms of which two powers only of the unknown quantity are found, and such that the index of the one is double that of the other, may, by the preceding rules, be reduced to a pure equation, and may therefore be resolved by § 1. of this chapter.

Such an equation may generally be represented thus:

$$x^{2m}\pm ax^m=\pm b^n$$

Let $x^m=z$, then $z^2\pm az=\pm b^n$

$$\text{And } x^m\ (=z)=\mp\frac{a}{2}\pm\sqrt{\frac{a^2}{4}\pm b^n}$$

$$\text{Therefore } x=\sqrt[m]{\mp\frac{a}{2}\pm\sqrt{\frac{a^2}{4}\pm b^n}}$$

Examp. 15. To find two numbers, of which the product is 100, and the difference of their square roots 3.

Let the less be x, the greater is	1	$\frac{100}{x}$
By question	2	$\frac{10}{\sqrt{x}}-\sqrt{x}=3$
	3	$10-x=3\sqrt{x}=3x^{\frac{1}{2}}$
	4	$x+3x^{\frac{1}{2}}=10$
	5	$x+3x^{\frac{1}{2}}+\frac{9}{4}=10+\frac{9}{4}=\frac{49}{4}$
	6	$x^{\frac{1}{2}}+\frac{3}{2}=\pm\frac{7}{2}$ and $x^{\frac{1}{2}}=2$ or -5
	7	$x=4$ or $x=25$

If $x=4$, the other number is 25; and this is the proper solution, for x was supposed to be the least. In this case, indeed, the negative root of the equation being applied according to the rules for negative quantities, gives a positive answer to the question; and if $x=25$, the other number is 4.

The same would have been got, by substituting in the general theorem $m=\frac{1}{2}$, $a=3$, and $b^n=10$; or, if the less number had been called x^2, the equation would not have had fractional exponents.

CHAP. VI.

Of Indeterminate Problems.

It was formerly observed (Chap III.), that if there are more unknown quantities in a question than equations

tions by which their relations are expressed, it is indetermined; or it may admit of an infinite number of answers. Other circumstances, however, may limit the number in a certain manner; and these are various, according to the nature of the problem. The contrivances by which such problems are resolved are so very different in different cases, that they cannot be comprehended in general rules.

Examp. 1. To divide a given square number into two parts, each of which shall be a square number.

There are two quantities sought in this question, and there is only one equation expressing their relation; but it is required also that they may be rational, which circumstance cannot be expressed by an equation: another condition therefore must be assumed, in such a manner as to obtain a solution in rational numbers.

Let the given square be a^2; let one of the squares sought be x^2, the other is a^2-x^2. Let $rx-a$ also be a side of this last square, therefore

$$r^2x^2-2rxa+a^2=a^2-x^2$$

By transsp. $\qquad r^2x^2+x^2=2rxa$

Divide by x $\qquad r^2x+x=2ra$

Therefore $\qquad x=\frac{2ra}{r^2+1}$

$$\text{And } rx-a\left(=\frac{2r^2a}{r^2+1}-a\right)=\frac{r^2a-a}{r^2+1}$$

Let r therefore be assumed at pleasure, and $\frac{2ra}{r^2+1}$, $\frac{r^2a-a}{r^2+1}$, which must always be rational, will be the sides of the two squares required.

Thus, if $a^2=100$; then if $r=3$, the sides of the two squares are 6 and 8, for $36+64=100$.

Also let $a^2=64$. Then if $r=2$, the sides of the squares are $\frac{32}{5}$ and $\frac{24}{5}$; and $\frac{1024}{25}+\frac{576}{25}=\frac{1600}{25}=64$.

The reason of the assumption of $rx-a$ as a side of the square a^2-x^2, is that being squared and put equal to this last, the equation manifestly will be simple, and the root of such an equation is always rational.

Examp. 2. To find two square numbers whose difference is given.

Let x^2 and y^2 be the square numbers, and a their difference.

Put $\frac{z+v}{2}=x$, and $\frac{z-v}{2}=y$

$$\frac{z^2+2zv+v^2}{4}=x^2$$

$$\frac{z^2-2zv+v^2}{4}=y^2$$

$$zv=(x^2-y^2=)a.$$

If x and y are required only to be rational, then take v at pleasure, and $z=\frac{a}{v}$, whence x and y are known.

But if x and y are required to be whole numbers, take for z and v any two factors that produce a, and are both even or both odd numbers. And this is possible only where a is either an odd number greater than 1, or a number divisible by 4. Then $\frac{z+v}{2}$ and $\frac{z-v}{2}$ are the numbers sought.

For the product of two odd numbers is odd, and that of two even numbers is divisible by 4. Also, if z and v are both odd or both even, $\frac{z+v}{2}$ and $\frac{z-v}{2}$ must be integers.

Ex. 1. If $a=27$, take $v=1$, then $z=27$; and the squares are 196 and 169. Or z may be 9 and $v=3$, and then the squares are 36 and 9.

2. If $a=12$, take $v=2$, and $z=6$; and the squares are 16 and 4.

Examp. 3. To find a sum of money in pounds and shillings, whose half is just its reverse.

Note. The reverse of a sum of money, as 8l. 12s. is 12l. 8s.

Let x be the pounds and y the shillings.
The sum required is $20x+y$
Its reverse is - $20y+x$

Therefore - $\frac{20x+y}{2}=20y+x$

$$20x+y=40y+2x$$

$$18x=39y$$

$$x:y::(39:18::)\ 13:6$$

In this equation there are two unknown quantities; and, in general, any two numbers of which the proportion is that of 13 to 6 will agree to it.

But, from the nature of this question, 13 and 6 are the only two that can give the proper answer, viz. 13l. 6s. for its reverse 6l. 13s. is just its half.

The ratio of x and y is expressed in the lowest integral terms by 13 and 6; any other expression of it, as the next greater 26 and 12, will not satisfy the problem, as 12l. 26s. is not a proper notation of money in pounds and shillings.

CHAP. VII.

Demonstrations of Theorems by Algebra.

Algebra may be employed for the demonstration of theorems, with regard to all those quantities concerning which it may be used as an analysis; and from the general method of notation and reasoning, it possesses the same advantages in the one as in the other. The three first sections of this chapter contain some of the most simple properties of series which are of frequent use; and the last, miscellaneous examples of the properties of algebraical quantities and numbers.

I. *Of Arithmetical Series.*

Def. When a number of quantities increase or decrease by the same common difference, they form an arithmetical series.

Thus, a, $a+b$, $a+2b$, $a+3b$, &c, x, $x-b$, $x-2b$, &c.

Also, 1, 2, 3, 4, 5, 6, &c. and 8, 6, 4, 2, &c.

Prop. In an arithmetical series, the sum of the first and

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and last terms is equal to the sum of any two intermediate terms, equally distant from the extremes.

Let the first term be a, the last x, and b the common difference; then $a+b$ will be the second, and $x-b$ the last but one, &c.

Thus, $a,\ a+b,\ a+2b,\ a+3b,\ a+4b$, &c.
$x,\ x-b,\ x-2b,\ x-3b,\ x-4b$, &c.

It is plain, that the terms in the same perpendicular rank are equally distant from the extremes; and that the sum of any two in it is $a+x$, the sum of the first and last.

Cor. 1. Hence the sum of all the terms of an arithmetical series is equal to the sum of the first and last, taken half as often as there are terms.

Therefore if n be the number of terms, and s the sum of the series; $s=\overline{a+x}\times\frac{n}{2}$. If $a=0$, then $s=\frac{nx}{2}$.

Cor. 2. The same notation being understood, since any term in the series consists of a, the first term, together with b taken as often as the number of terms preceding it, it follows, that $x=a+\overline{n-1}\times b$, and hence $s=\overline{2a+\overline{n-1}\times b}\times\frac{n}{2}$; or by multiplication, $s=\frac{2an+n^2b-nb}{2}$. Therefore from the first term, the common difference, and number of terms being given, the sum may be found.

Ex. Required the sum of 50 terms of the series 2, 4, 6, 8, &c.

$$s=\frac{2\times2\times50+50^2\times2-50\times2}{2}=\frac{5100}{2}=2550.$$

Cor. 3 Of the first term, common difference, sum and number of terms, any three being given, the fourth may be found by resolving the preceding equation; a, b, s, and n, being successively considered as the unknown quantity. In the three first cases the equation is simple, and in the last it is quadratic.

II. *Of Geometrical Series*

Def. When a number of quantities increase by the same multiplier, or decrease by the same divisor, they form a geometrical series. This common multiplier or divisor is called the *common ratio.*

Thus, $a,\ ar,\ ar^2$, &c. $a,\ \frac{a}{r},\ \frac{a}{r^2},\ \frac{a}{r^3}$, &c.

1, 2, 4, 8, &c.

Prop. I. The product of the extremes in a geometrical series is equal to the product of any two terms, equally distant from the extremes.

Let a be the first term, y the last, r the common ratio: then the series is,

$$a,\ ar,\ ar^2,\ ar^3,\ ar^4,\ \&c$$
$$y,\ \frac{y}{r},\ \frac{y}{r^2},\ \frac{y}{r^3},\ \frac{y}{r^4},\ \&c.$$

It is obvious, that any term in the upper rank is equally distant from the beginning as that below it from the end; and the product of any two such is equal to ay, the product of the first and last.

Prop. II. The sum of a geometrical series wanting the first term, is equal to the sum of all but the last term multiplied by the common ratio.

For, assuming the preceding notation of a series, it is plain, that

$$ar+ar^2+ar^3,\ \&c.\ \ldots+\frac{y}{r^3}+\frac{y}{r^2}+\frac{y}{r}+y=$$
$$=\overline{r\times a+ar+ar^2,\ \&c.\ \ .+\frac{y}{r^4}+\frac{y}{r^3}+\frac{y}{r^2}+\frac{y}{r}}$$

Cor. 1. Therefore s being the sum of the series, $\overline{s-y}\times r=s-a$. And $s=\frac{yr-a}{r-1}$

Hence s can be found from a, y, and r; and any three of the four being given, the fourth may be found.

Cor. 2. Since the exponent of r in any term is equal to the number of terms preceding it; hence in the last term its exponent will be $n-1$; the last term, therefore, $y=ar^{n-1}$, and $s=\frac{ar^n-a}{r-1}=a\times\frac{r^n-1}{r-1}$. Hence of these four, s, a, r, n, any three being given, the fourth may be found by the solution of equations. If n is not a small number, the cases of this problem will be most conveniently resolved by logarithms; and of such solutions there are examples in the appendix to this part.

Cor. 3. If the series decreases, and the number of terms is infinite; then, according to this notation, a the least term will be 0, and $s=\frac{yr}{r-1}$, a finite sum.

Ex. Required the sum or the series 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, &c. to infinity.

Here $y=1$, and $r=2$. Therefore $s=\frac{1\times2}{2-1}=2$.

What are called in arithmetic *repeating* and *circulating decimals*, are truly geometrical decreasing serieses, and therefore may be summed by this rule.

Thus .333, &c. $=\frac{3}{10}+\frac{3}{100}+$, &c. is a geometrical series in which $y=\frac{3}{10}$ and $r=10$; therefore $s=\frac{yr}{r-1}$ $=\frac{3\times10}{10\times\overline{10-1}}=\frac{1}{3}$.

Thus, also, .2424, &c. $=\frac{8}{33}$, for here $y=\frac{24}{100}$ and $r=100$; therefore $s=\frac{24\times100}{100\times\overline{100-1}}=\frac{24}{99}=\frac{8}{33}$.

III. *Of Infinite Series.*

It was observed (Chap. I. and IV.), that in many cases, if the division and evolution of compound quantities be actually performed, the quotients and roots can only be expressed by a series of terms, which may be continued *ad infinitum.* By comparing a few of the first terms, the law of the progression of such a series

ries will frequently be discovered, by which it may be continued without any farther operation. When this cannot be done, the work is much facilitated by several methods; the chief of which is that by the binomial theorem.

THEOREM. *Any binomial (as* a+b) *may be raised to any power* (m) *by the following rules.*

1. From inspecting a table of the powers of a binomial obtained by multiplication, it appears that the terms without their coefficients, are a^m, $a^{m-1}b$, $a^{m-2}b^2$, $a^{m-3}b^3$, &c.

2. The coefficients of these terms will be found by the following rule.

Divide the exponent of a in any term by the exponent of b increased by 1, and the quotient multiplied by the coefficient of that term will give the coefficient of the next following term.

This rule is found, upon trial in the table of powers, to hold universally. The coefficient of the first terms is always 1; and by applying the general rule now proposed, the coefficients of the terms in order will be as follows: $1, m, m\times\frac{m-1}{2}, m\times\frac{m-1}{2}\times\frac{m-2}{3}$, &c. They may be more conveniently expressed thus: $1, Am, B\times\frac{m-1}{2}, C\times\frac{m-2}{3}, D\times\frac{m-3}{4}$, &c. the capitals denoting the preceding coefficient. Hence $\overline{a+b}|^m=a^m+Ama^{m-1}b+B\times\frac{m-1}{2}\times a^{m-2}b^2+C\times\frac{m-2}{3}a^{m-3}b^3$, &c. This is the celebrated binomial theorem. It is deduced here by induction only; but it may be rigidly demonstrated, though upon principles which do not belong to this place.

Cor. 1. As m may denote any number, integral or fractional, positive or negative; hence the division, involution, and evolution, of a binomial, may be performed by this theorem.

Ex. 1. Let $m=\frac{1}{2}$, then $\overline{a+b}|^{\frac{1}{2}}=a^{\frac{1}{2}}+\frac{1}{2}a^{-\frac{1}{2}}b+\frac{1}{2}\times-\frac{1}{4}\times a^{-\frac{3}{2}}b^2+$, &c. This being applied to the extraction of the square root of a^2+x^2 (by inserting a^2 for a and x^2 for b), the same series results as formerly (Chap. IV.)

Ex. 2. If $\frac{1}{1-r}$ is to be turned into an infinite series, since $\frac{1}{1-r}=1\times\overline{1-r}|^{-1}$, let $a=1$, $b=-r$, and $m=-1$; and the same series will arise as was obtained by division (Chap. I.).

In like manner $\frac{r^2}{\sqrt{2rz-z^2}}(=r^2\times\overline{2rz-z^2}|^{-\frac{1}{2}})$ may be expressed by an infinite series, by supposing $a=2rz$, $b=-z^2$, and $m=-\frac{1}{2}$, and then multiplying that series by r^2.

Cor. 2. This theorem is useful also in discovering the *law* of an infinite series produced by division or evolution. Thus, the series expressing the square root of a^2+x^2, consists of a, together with a series of fractions; in the numerators of which are the even powers of x, and in the denominators the odd powers of a. The numeral coefficients of the terms of the whole series, as deduced by the theorem, will be: $1, +\frac{1}{2\times1}, -\frac{1\times1}{2.2\times1.2}, +\frac{1\times1.3}{2.2.2\times1.2.3}, -\frac{1\times1.3.5}{2.2.2.2\times1.2.3.4}$, &c. the point being used (as it often is) to express the product of the numbers between which it is placed. The law of continuation is obvious; and the series may be carried on to any number of terms, without using the theorem. Hence also the coefficient of the nth term is $\frac{1\times1.3.5 \text{ \&c.} \ldots (n-2 \text{ terms})}{2^{n-1}\times1.2.3.4 \text{ \&c.} (n-1)}$; and it is + if n is an even number, and − if n is odd.

Note. If the binomial is $a+b$, the signs of the terms of any power are all positive; if it is $a-b$ the alternate terms are negative, beginning at the second. This theorem may be applied to quantities which consist of more than two parts, by supposing them distinguished into two, and then substituting for the powers of these compound parts their values, to be obtained also, if required, from the theorem. Thus, $\overline{a+b+c}|^2=\overline{a+\overline{b+c}}|^2$.

Scholium.

An infinite series may itself be multiplied or divided by another; it may be involved or evolved: and various other operations may be performed upon it which are necessary in the higher parts of algebra. The methods for finding the sum depend upon other principles.

IV. *Properties of Numbers.*

THEOR. I. *The sum of two quantities multiplied by their difference is equal to the difference of their squares.*

Let the quantities be represented by a and b, then $\overline{a+b}\times\overline{a-b}=a^2-b^2$, as appears by performing the operation.

Cor. If a and b be any two quantities of which the sum may be denoted by s, the difference by d, and their product by p, then the following propositions will be true.

1. $a^2+b^2=s^2-2p$	2. $a^2-b^2=sd$
3. $a^3+b^3=s^3-3ps$	4. $a^3-b^3=s^2d-dp$
5. $a^4+b^4=s^4-4ps^2+2p^2$	6. $a^4-b^4=s^3d-2sdp$, &c.

It is unnecessary to express these propositions in words, and the demonstrations are very easy, by raising $a+b$ to certain powers, and making proper substitutions.

THEOR. II. *The sum of any number of terms* (n) *of the odd numbers* 1, 3, 5, *&c. beginning with* 1, *is equal to the square of that number* (n).

In the rule for summing an arithmetical series, let $a=1$, $b=2$, and $n=n$, and the sum of this series will be $s=\frac{2an+n^2b-an^2}{2}=\frac{an^2}{2}=n^2$. Q. E. D.

THEOR-

Demonstration of Theorems.

THEOR. III. *The difference of any two square numbers is equal to the sum of the two roots, together with twice the sum of the numbers in the natural scale between the two roots.*

Let the one number be p, and the other $p+n$, the intermediate numbers are $p+1$, $p+2$, ... &c. $p+n-1$. The difference of the squares of the given numbers is $2pn+n^2$; the sum of the two roots is $2p+n$, and twice the sum of the series $\overline{p+1}+\overline{p+2}$ ... &c. $\overline{p+n-1}$ is (by Cor. 1. 1st Sect of this Chap.) $2s=\overline{2p+n}\times\overline{n-1}$, viz. the sum of the first and last multiplied by the number of terms, and it is plain that $2p+n+\overline{2p+n}\times\overline{n-1}=2pn+n^2$. Therefore, &c.

Lem. 1. Let r be any number, and n any integer, r^n-1 is divisible by $r-1$.

The quotient will be $r^{n-1}+r^{n-2}$, &c. till the index of r be 0, and then the last term of it will be 1; for if this series be multiplied by the divisor $r-1$, it will produce the dividend r^n-1. It will appear also by performing the division, and inserting for n any number.

Lem. 2. Let r be any number, and n any integer odd number, r^n+1 is divisible by $r+1$. Also, if n is any even number, r^n-1 is divisible by $r+1$.

The quotient in both cases is $r^{n-1}-r^{n-2}+r^{n-3}$ &c. till the exponent of r be 0, and the last term $r^0=1$. If this series consist of an odd number of terms, and be multiplied by $r+1$ the divisor, the product is r^n+1 the dividend. If the series consist of an even number of terms, the product is r^n-1; but it is plain that the number of terms will be odd only when n is odd, and even only when n is even. The conclusion will be manifest by performing the division.

Lem. 3. If r is the root of an arithmetical scale, any number in that scale may be represented in the following manner, a, b, c, &c. being the coefficients or digits, $a+br+cr^2+dr^3+er^4$, &c.

THEOR. IV. *If from any number in the general scale now described, the sum of its digits be subtracted, the remainder is divisible by* $r-1$.

The number is $a+br+cr^2+dr^3$, &c. and the sum of the digits is $a+b+c+d$, &c. Subtracting the latter from the former, the remainder is $br-b+cr^2-c+dr^3-d$, &c. $=b\times\overline{br-1}+c\times\overline{r^2-1}+d\times\overline{r^3-1}$, &c. But, (by Lem. 1.) r^n-1 is divisible by $r-1$, whatever integer number n may be, and therefore any multiple of r^n-1 is also divisible by $r-1$: Hence each of the terms, $b\times\overline{r-1}$, $c\times\overline{r^2-1}$, &c. is divisible by $r-1$, and therefore the whole is divisible by $r-1$.

Cor. 1. Any number, the sum of whose digits is divisible by $r-1$, is itself divisible by $r-1$. Let the number be called N, and the sum of the digits D; then by this prop. $N-D$ is divisible by $r-1$, and D is supposed to be divisible by $r-1$; therefore it is plain that N must also be divisible by $r-1$.

Cor. 2. Any number, the sum of whose digits is divisible by an aliquot part of $r-1$, is also divisible by that aliquot part. For, let N and D denote as before; and since $N-D$ (Theor. 4.) is divisible by $r-1$, it is also divisible by an aliquot part of $r-1$; but D is divisible by an aliquot part of $r-1$, therefore N is also divisible by that aliquot part.

Cor. 3. This theorem, with the corollaries, relates to any scale whatever. It includes therefore the well known property of 9 and of 3 its aliquot part, in the decimal scale; for, since $r=10$, $r-1=9$.

THEOR. V. *In any number, if from the sum of the coefficients of the odd powers of* r *the sum of the coefficients of the even powers be subtracted, and the remainder added to the number itself, the sum will be divisible by* $r+1$.

In the number $a+br+cr^2+dr^3+er^4+fr^5$, &c. the sum of the coefficients of the odd powers of r is $b+d+f$, &c. the sum of the coefficients of the even powers of r is $a+c+e$, &c. If the latter sum be subtracted from the former, and the remainder added to the given number, it makes $br+b+cr^2-c+dr^3+d+er^4-e+fr^5+f$, &c. $=b\times\overline{r+1}+c\times\overline{r^2-1}+d\times\overline{r^3+1}+e\times\overline{r^4-1}+f\times\overline{r^5+1}$, &c. But (by Lem. 2.) $r+1$, r^2-1, r^3+1, &c. are each divisible by $r+1$, and therefore any multiples of them are also divisible by $r+1$, hence the whole number is divisible by $r+1$.

Cor. 1. If the difference of the sum of the even digits, and the sum of the odd digits of any number be divisible by $r+1$, the number itself is divisible by $r+1$.

Let the sum of the even digits (that is, the coefficients of the odd powers of r) be D, the sum of the odd digits be d, and let the number be N. Then by the theorem $N+D-d$ is divisible by $r+1$, and it is supposed that $D-d$ is divisible by $r+1$; therefore N is divisible by $r+1$.

Cor. 2. In like manner, if $D-d$ is divisible by an aliquot part of $r+1$, N will be divisible by that aliquot part.

Cor. 3. If a number want all the odd powers of r, or if it want all the even powers of r, and if the sum of its digits be divisible by $r+1$, that number is divisible by $r+1$.

Cor. 4. In the common scale $r+1=11$, which therefore will have the properties mentioned in this theorem, and the corollaries. Thus, in the number 64834, the sum of the even digits is 7, the sum of the odd digits is 18, and the difference is 11, a number divisible by 11, the given number therefore (Cor. 1.) is divisible by 11. Thus also, the sum of the digits of 7040308 is divisible by 11, and therefore the number is divisible by 11. (Cor. 3.)

Scholium.

These theorems relate to any scale whatever, and therefore the properties of $r-1$ in Theor. 4. would in a scale of *eight* belong to *seven*, and those in Theor. 5. to *nine*. If *twelve* was the root of the scale, the former properties would belong to *eleven*, and the latter to *thirteen*.

APPENDIX to PART I.

ALGEBRA may be employed in expressing the relations of magnitude in general, and in reasoning with regard to them. It may be used in deducing not only the relations of number, but also those of extension, and hence those of every species of quantity expressible by numbers or extended magnitudes. In this appendix are mentioned some examples of its application to other parts of mathematics, to physics, and to the

Application to Geometry.

the practical calculations of business. The principles and suppositions peculiar to these subjects, which are necessary in directing both the algebraical operations, and the conclusions to be drawn from them, are here assumed as just and proper.

I. *Application of Algebra to Geometry.*

Algebra has been successfully applied to almost every branch of mathematics; and the principles of these branches are often advantageously introduced into algebraical calculations.

The application of it to *geometry* has been the source of great improvement in both these sciences: on account of its extent and importance it is here omitted, and the principles of it are more particularly explained in the third part of these elements.

In this place shall be given an example of the use of logarithms in resolving certain algebraical questions.

Note. When logarithms are used, let ($l.$) denote the logarithm of any quantity before which it is placed.

Ex. To find the number of terms of a geometrical series, of which the sum is 511, the first term 1, and the common ratio 2.

From sect. 2. chap. 6. it appears that $s = \frac{ar^n - a}{r - 1}$, and in this problem, s, r, and a are given, and n is to be found. By reducing the equation $r^n = \frac{s \times \overline{r-1} + a}{a}$ and from the known property of logarithms $n \times l.r = l.\, s \times \overline{r-1} + a - l.a$, and $n = \frac{l.s \times \overline{r-1} + a - l.a.}{l.r}$ But here $s = 511$, $a = 1$, $r = 2$, and $n = \frac{l.512}{l.2} = \frac{2.7092700}{0.3010300} = 9.$

In like manner may any such equation be resolved, when the only unknown quantity is an exponent, and when it is the exponent only of one quantity.

Ex. 2. An equation of the following quadratic form $a^{2x} \pm 2ba^x = \pm c$ may be resolved by logarithms. 1st, by scholium of Chap. V. $a^x = \pm b \pm \sqrt{b^2 \pm c}$. And then x is discovered in the same manner as in the preceding example. Thus, let $a = 2$, $b = 10$, and $c = 96$ and the equation $2^{2x} - 20 \times 2^x = -96$. 1st, $2^x = 10 \pm \sqrt{4} = 12$ or 8. If $2^x = 8$ then $x = \frac{l.8}{l.2} = 3$ and $2^6 - 20 \times 2^3 = -96$ is a true equation. If $2^x = 12$, then $x = \frac{l.12}{l.2} = \frac{1.0791812}{0.3010300} = 3.5849$, and this number being inserted for x in the given equation, by means of logarithms, will answer the conditions.

Ex. 3. The sum of 2000l. has been out at interest for a certain time, and 500l. has been at interest double of that time, the whole arrear now due reckoning 4 *per cent.* compound interest, is 6000l. What were the times?

By the rules in the third part of this appendix for compound interest, it is plain that if $R = 1.04$, and the time at which the 2000l. is at interest be x, the arrear of it will be $2000 \times R^x$. The arrear of the 500l. is $500 \times R^{2x}$, hence $500 \times R^{2x} + 2000 \times R^x = 6000$. This resolved gives $R^x = 2$ and $x = \frac{l.2}{l.R} = 17.67$, + nearly, that is, 17 years and 8 months nearly, and the double is 35 years and 4 months; which answer the conditions.

Application to Physics.

II. *Application of Algebra to Physics.*

Physical quantities which can be divided into parts, that have proportions to each other, the same as the proportions of lines to lines, or of numbers to numbers, may be expressed by lines and numbers, and therefore by algebraical quantities. Hence these mathematical notations may be considered as the measures of such physical quantities; they may be reasoned upon according to the principles of algebra, and from such reasonings, new relations of the quantities which they represent may be discovered.

In those branches of natural philosophy, therefore, in which the circumstances of the phenomena can be properly expressed by numbers, or geometrical magnitudes, algebra may be employed, both in promoting the investigation of physical laws by experience, and also in deducing the necessary consequences of laws investigated and presumed to be just.

It is to be observed likewise, that if various hypotheses be assumed concerning physical quantities, without regard to what takes place in nature, their consequences may be demonstratively deduced, and thus a science may be established, which may be properly called *mathematical*. The use of algebra in this science, which is sometimes called *Theoretical Mechanics*, is obvious from the principles already laid down.

In conducting these inquiries, it is to be observed, that, for the sake of brevity, the language of algebraical operation is often used with regard to physical quantities themselves; though it is always to be understood, that, in strict propriety, it can be applied only to the mathematical notations of these quantities.

Before illustrating this application of algebra by examples, it may be proper to explain a method of stating the proportion of variable quantities, and reasoning with regard to it, which is of general use in natural philosophy.

1. *Of the Proportion of variable Quantities.*

Mathematical quantities are often so connected, that when the magnitude of one is varied, the magnitudes of the others are varied, according to a determined rule. Thus, if two straight lines, given in position, interfect each other; and, if a straight line, cutting both, moves parallel to itself, the two segments of the given lines between their intersection and the moving line, however varied, will always have the same proportion. Thus also, if an ordinate to the diameter of a parabola move parallel to itself, the abscifs will be increased or diminished in proportion as the square of the ordinate is increased or diminished.

In like manner may algebraical quantities be connected. If x, y, z, &c. represent any variable quantities, while a, b, c, represent such as are constant or invariable, then an equation containing two or more variable quantities, with any number of constant quantities, will exhibit a relation of variable quantities, similar to those already mentioned. Thus, if $ax = by$, then $x : y :: b : a$, that is, x has a constant proportion to y, in in whatever way these two quantities may be varied. Likewise, if $xy^2=a^2b$, then $y^2:a^2::b:x$, or $y^2:\frac{1}{x}::a^2:\frac{1}{b}$, that is, y^2 has a constant proportion to the reciprocal of x, or y^2 is increased in the same proportion as x is diminished, and conversely. It is necessary to premise the following definitions.

Definitions.

Let there be any number of variable quantities, X, Y, Z, V, &c. connected in such a manner, that when X becomes x, Y, Z, V, &c. become respectively y, z, v, &c. And let a, b, c, &c. represent any constant quantities, whether given or unknown. Then

1. If two variable quantities X and Y are so connected, that whatever be the values of x and y, $X:x::Y:y$, this proportion is expressed thus, $X=Y$, and X is said to be *directly as* Y, or shortly, X is said to be *as* Y.

2. If two variable quantities X and Y are so connected, that $X:x::y:Y$, or $X:x::\frac{1}{Y}:\frac{1}{y}$, their relation is thus expressed, $X=\frac{1}{Y}$; and X is said to be *inversely*, or *reciprocally as* Y.

3. If X, Y, Z, are three variable quantities, so connected that $X:x::YZ:yz$, their relation is so expressed, $X=YZ$, and X is said to be *directly as* Y and Z, *jointly*; or X is said to be as Y and Z.

4. If any number of variable quantities as X, Y, Z, V, &c. are so connected, that $XY:xy::\frac{YZ}{V}:\frac{yz}{v}$; then $YY=\frac{YZ}{V}$, and XY is said to be directly as YZ, and inversely as V, or more explicitly, X and Y *jointly*, are *directly as* Y *and* Z *jointly*, and *inversely as* V.

In like manner are other combinations of variable qualities denoted and expressed.

It is to be observed also, the same definitions take place, when the variable quantities are multiplied or divided by any constant quantities. Thus, if $aX:ax::\frac{b}{Y}:\frac{b}{y}$ then $aX=\frac{b}{Y}$, &c.

5. Let the preceding notation of proportion be called a *proportional equation* (A), the equation formerly treated of being in this place, for the sake of distinction, called *absolute*.

Cor. Every absolute equation, containing more than one variable quantity, may be considered as a proportional equation; and in a proportional equation, if at any particular corresponding values of the variable quantities, the equation becomes absolute, it will be universally absolute.

Prop. 1. If one side of a proportional equation be either multiplied or divided by any constant quantity, it will continue to be true. Thus, if $X=\frac{1}{Y}$, then $X=\frac{a^2}{bY}$. For since $X=\frac{1}{Y}$ (Def. 3.) $X:x::\frac{1}{Y}:\frac{1}{y}$, it follows, (Chap. II.) that $X:x::\frac{a^2}{bY}:\frac{a^2}{by}$, therefore (Def. 4.) $X=\frac{a^2}{bY}$.

Prop. 2. If the two sides of a proportional equation be both multiplied, or both divided by the same quantity, it will continue to be true.

1st, If the quantity be constant, it is manifest from Prop. 1.

2d, If the quantity be variable, let $X=Y$, and Z a variable quantity, then $XZ=YZ$. For, since $X=Y$, (Def. 2.) $X:x::Y:y$; multiply the antecedents by Z, and the consequents by z, then $XZ:xz::YZ:yz$, therefore (Def. 5.) $XZ=YZ$. In like manner, if $X=Y$, $\frac{X}{Z}=\frac{Y}{Z}$.

Cor. Any variable quantity, which is a factor of one side of a proportional equation, may be made to stand alone. Thus, if $XY=\frac{Z}{V}$, then $X=\frac{Z}{VY}$; also, $Z=XYV$; and $Y=\frac{Z}{XV}$, and also $V=\frac{Z}{XY}$, &c. Hence also, if one side of a proportional equation be divided by the other, the quotient is a constant quantity, *viz.* 1.

Prop. 3. If two proportional equations have a common side, the remaining two sides will form a proportional equation. Also, that common side will be *as* the sum or difference of the other two.

Thus, if $X=Y$, and $Y=Z$, then $X=Z$. For $X:x::Y:y$, and $Y:y::Z\,z$, therefore multiplying these ratios, $XY:xy::YZ:yz$, and by dividing antecedents and consequents, $X:x::Z:z$, therefore (Def. 2.) $X=z$.

Likewise, if $X=Y$, and $Y=Z$, $Y=X\pm Z$. For, since $X:x.:Y:y::Z:z$. (Chap. II.) $Y:y::X\pm Z:x\pm z$, therefore (Def. 5.) $Y=X\pm Z$.

Cor. Hence, one side of a proportional equation will be *as* the sum, or *as* the difference of the two sides; and the sum of the two sides will be *as* their difference. Thus, if $X=Y+Z$, then $X=X+Y+Z$ and $X=X-Y-Z$, and also $X+Y+Z=X-Y-Z$.

Prop. 4. If the two sides of a proportional equation be respectively multiplied or divided by the two sides of any other proportional equation, the products or quotients will form a proportional equation.

Thus, if $X=Y$, and $Z=V$, then $XZ=YV$. For since $X:x::Y:y$, and $Z:z::V:v$, by multiplying these proportions (Chap. I. II.) $XZ:xz::YV:yv$, therefore (Def. 5.) $XZ=YV$. In like manner in the case of division.

Cor. 1. The two sides of a proportional equation may be raised to any power, or any root may be extracted out of both, and the equation will continue to be true.

Thus, if $X=Y$, then $X^m=Y^m$; for since $X=Y$, $X:x$

(A) These terms are used only with a view to give more precision to the ideas of beginners. In order to avoid the ambiguity in the meaning of the sign $=$, some writers employ the character $\propto$, to denote constant proportion; but this is seldom necessary, as the quantities compared are generally of different kinds, and the relation expressed is sufficiently obvious. See Emerson's Mathematics, vol. I.

$X : x :: Y : y$, and therefore $X^m : x^m :: Y^m : y^m$; therefore $X^m = Y^m$. And, if $X = Y$, also $X^{\frac{1}{m}} = Y^{\frac{1}{m}}$.

Cor. 2. If two proportional equations have a common side, that side will be *as* the square root of the product of the other two. Thus if $X = Y$, and $Y = Z$, by this Prop. $Y^2 = XZ$, and (Cor. 1.) $Y = \sqrt{XZ}$. Hence also, in this case, $\sqrt{XZ} = X = Z$; for (Prop. 3.) $Y = X = Z$.

Cor. 3. If one side of a proportional equation be a factor of a side of another proportional equation, the remaining side of the former may be inserted in the latter, in place of that factor. Thus, if $X = ZY$, and $Z = \frac{1}{V}$, then $X = \frac{Y}{V}$, as appears by multiplying the two equations, and dividing by Z.

Prop. 5. Any proportional equation may be made absolute, by multiplying one side by a constant quantity.

Thus, if $X = Y$, then let two particular corresponding values of these variable quantities be assumed as constant, and let them be a and b, then $X : a :: Y : b$, and $Xb = aY$, or $X = Y \times \frac{a}{b}$, an absolute equation.

Scholium.

1. If there be two variable physical quantities, either of the same, or of different kinds, which are so connected, that when the one is increased or diminished, the other is increased or diminished in the same proportion; or, if the magnitudes of the one, in any two situations, have the same ratio to each other, as the magnitudes of the other in the corresponding situations, the relation of the mathematical measure of these quantities may be expressed by a proportional equation, according to Def. 1.

2. If two variable physical quantities be so connected, that the one increases in the same proportion as the other is diminished, and conversely; or, if the magnitudes of the one, in any two situations, be reciprocally proportional to the magnitudes of the other, in the corresponding situations, the relation of their measures may be expressed by a proportional equation, according to Def. 2.

3. If three variable physical quantities are so connected, that one of them is increased or diminished, in proportion as both the others are increased or diminished; or, if the magnitudes of one of them, in any two situations, have a ratio which is compounded of the ratios of the magnitudes of the other two, in the corresponding situations; the relation of the measures of these three may be expressed by a proportional equation, according to Def. 3.

4. In like manner may the relations of other combinations of physical quantities be expressed according to Def. 4. And when these proportional equations are obtained, by reasoning with regard to them, according to the preceding propositions, new relations of the physical quantities may be deduced.

2. *Examples of Physical Problems.*

The use of algebra, in natural philosophy, may be properly illustrated by some examples of physical problems. The solution of such problems must be derived from known physical laws, which, though ultimately founded on experience, are here assumed as principles, and reasoned upon mathematically. The experiments by which the principles are ascertained admit of various degrees of accuracy; and on the degree of physical accuracy in the principles will depend the physical accuracy of the conclusions mathematically deduced from them. If the principles are inaccurate, the conclusions must, in like manner, be inaccurate; and, if the limits of inaccuracy in the principles can be ascertained, the corresponding limits, in the conclusions derived from them, may likewise be calculated.

Examp. 1. Let a glass tube, 30 inches (a) long, be filled with mercury, excepting 8 inches (b); and let it be inverted as in the Toricellian experiment, so that the 8 inches of common air may rise to the top: It is required to find at what height the mercury will remain suspended, the mercury in the barometer being at that time 28 inches (d) high.

The solution of this problem depends upon the following principles:

1. The pressure of the atmosphere is measured by the column of mercury in the barometer; and the elastic force of the air, in its natural state, which resists this pressure, is therefore measured by the same column.

2. In different states, the elastic force of the air is reciprocally as the spaces which it occupies.

3. In this experiment, the mercury which remains suspended in the tube, together with the elastic force of the air in the top of it, being a counterbalance to the pressure of the atmosphere, may therefore be expressed by the column of mercury in the barometer.

Let the mercury in the tube be x inches, the air in the top of it accupies now the space $a-x$; it occupied formerly b inches, and its elastic force was d inches of mercury: Now, therefore, the force must be ($a-x : b :: d :$) $\frac{bd}{a-x}$ inches. (2.) Therefore (3.) $x + \frac{bd}{a-x} = d$. This reduced, and putting $a+d=2m$ the equation is $x^2 - 2mx = bd - ad$.

This resolved gives $x = m \pm \sqrt{m^2 + bd - ad}$.

In numbers - - $x = 44$ or 14.

One of the roots 44 is plainly excluded in this case, and the other, 14, is the true answer. If the column of mercury x, suspended in the tube, were a counterbalance to the pressure of the atmosphere, expressed by the height of the barometer d, together with the measure of the elastic force of b inches of common air in the space $x-a$, that is, if $x = d + \frac{bd}{x-a}$, or $x - \frac{bd}{x-a} = d$, the equation will be the same as before, and the root 44 would be the true answer. But the experiment in this question does not admit of such a supposition.

Examp. 2. The distance of the earth and moon (d), and their quantities of matter (t, l), being given, to find the point of equal attraction between them.

Let the distance of the point from the earth be x: Its distance from the moon will be therefore $d-x$. But gravitation is *as* the matter *directly*, and *as* the square of the distance *inversely*; therefore the earth's attraction is *as* $\frac{t}{x^2}$; and the moon's attraction is as $\frac{l}{\overline{d-x}|^2}$. But these are here equal; therefore,

$$\frac{t}{x^2}=\frac{l}{\overline{d-x}|^2}\text{ and }\frac{\sqrt{t}}{x}=\frac{\sqrt{l}}{d-x}$$

This equation reduced gives $x=\dfrac{d\sqrt{t}}{\sqrt{t}+\sqrt{l}.}$

Or mult. numerator and denominator by $\sqrt{t}-\sqrt{l}$ $\Big\}$ $x=\dfrac{dt-d\sqrt{tl}.}{t-l}$

In round numbers, let $d=60$ semidiameters of the earth, $t=40$, $l=1$, then $x=52$ semidiameters nearly. There is another point beyond the moon at which the attractions are equal, and it would be found by putting the square root of $\overline{d-x}|^2$ to be $x-d$, which, in this case, would be a positive quantity; and then $x=\dfrac{dt+d\sqrt{tl}}{t-l}$ $=72$ nearly. If the quantities had been multiplied before extracting the square roots, the adfected quadratic would have given the same two roots.

Examp. 3. Let a stone be dropt into an empty pit; and let the time from the dropping of it to the hearing the sound from the bottom be given: To find the depth of the pit.

Let the given time be a; let the fall of a heavy body in the 1st second of time (16.122 feet) be b: also, let the motion of sound in a second (1142 feet) be c.

Let the time of the stone's fall be -	1	x
The time in which the sound of it moves to the top is - -	2	$a-x$
The descent of a falling body is as the square of the time, therefore the depth of the pit is ($1^2 : x^2 :: b :$)	3	bx^2
The depth from the motion of sound is also - - -	4	$ca-cx$
Therefore 3 and 4 - -	5	$bx^2=ca-cx$

This equation being resolved, gives the value of x, and from it may be got bx^2 or $ca-cx$, the depth of the pit.

If the time is 10″, then $x=8.835$ nearly, and the depth is 1273 feet.

There are several circumstances in this problem which render the conclusion inaccurate.

1. The values of c and b, on which the solution is founded, are derived from experiments, which are subject to considerable inaccuracies.

2. The resistance of the air has a great effect in retarding the descent of heavy bodies, when the velocity becomes so great as is supposed in this question; and this circumstance is not regarded in the solution.

3. A small error, in making the experiment to which this question relates, produces a great error in the conclusion. This circumstance is particularly to be attended to in all physical problems; and, in the present case, without noticing the preceding imperfections, an error of half a second, in estimating the time, makes an error of above 100 feet in the expression of the depth of the pit.

III. *Of Interest and Annuities.*

The application of algebra to the calculation of interests and annuities, will furnish proper examples of its use in business. Algebra cannot determine the propriety or justice of the common suppositions on which these calculations are founded, but only the necessary conclusions resulting from them.

Notation.

In the following theorems let p denote any principal sum of which 1 l. is the unit, t the time during which it bears interest, of which one year shall be the unit, r the rate of interest of 1l. for one year, and let s be the amount of the principal sum p with its interest for the time t at the rate r.

I. *Of Simple Interest.*

$s=p+ptr$, and of these four, s, p, t, r, any three being given, the fourth may be found by resolving a simple equation.

The foundation of the canon is very obvious; for the interest of 1l. in one year is r, for t years it is tr, and for p pounds it is ptr; the whole amount of principal and interest must therefore be $p+ptr=s$.

II. *Of Compound interest.*

When the simple interest at the end of every year is supposed to be joined to the principal sum, and both to bear interest for the following year, money is said to bear compound interest. The same notation being used, let $1+r=R$. Then $s=pR^t$.

For the simple interest of 1l. in a year is r, and the new principal sum therefore which bears interest during the second year is ($1+r=$) R; the interest of R for a year is rR, and the amount of principal and interest at the end of the 2d year, is $R+rR=R\times\overline{1+r}=R^2$. In like manner, at the end of the 3d year it is R^3, and at the end of t years it is R^t, and for the sum p it is $pR^t=s$.

Cor. 1. Of these four p, R, t, s, any three being given the 4th may be found. When t is not very small, the solution will be obtained most conveniently by logarithms. When R is known r may be found, and conversely.

Ex. If 500l. has been at interest for 21 years, the whole arrear due, reckoning $4\frac{1}{2}$ per cent. compound interest, is 1260.121. or 1260l. 2s. 5d. In this case $p=500$, $R=1.045$ and $t=21$ and $s=1260.12$, and any one of these may be derived by the theorem from the others being known. Thus, to find s; $l\,R^t=t\times l.R=21\times0.0191163=0.4014423$, therefore $R^t=2.520242$ and $s=(pR^t=)$ $500\times2.520242=1260.121$.

Cor. 2. The present worth of a sum (s) in reversion that is payable after a certain time t is found thus. Let the present worth be x, then this money improved by compound interest during t produces xR^t, which must be equal to s, and if $xR^t=s$, $x=\dfrac{s}{R^t}$.

Cor. 3. The time in which a sum is doubled at compound interest will be found thus. $pR^t=2p$ and $R^t=2$ and $t=\dfrac{l.\ 2}{l.\ R}$; thus, if the rate is 5 per cent. $r=.05$ and $\dfrac{l.\ 2}{l.\ 1.05}=\dfrac{0.3010300}{0.0211893}=14.2066$, that is 14 years and 75 days nearly.

Scholium.

Many other suppositions might be made with regard to the improvement of money by compound interest. The interest might be supposed to be joined to the capital, and along with it to bear interest at the end of every

every month, at the end of every day, or even at the end of every instant, and suitable calculations might be formed; but these suppositions, being seldom used in practice, are omitted.

III. *Of Annuities.*

An annuity is a payment made annually for a certain term of years, and the chief problem with regard to it is, 'to determine its present worth.' The supposition on which the solution proceeds is, that the money received by the seller, being improved by him in a certain manner during the continuance of the annuity, amounts to the same sum as the several payments received by the purchaser, improved in the same manner. The suppositions with regard to the improvement may be various. What is called the *method of simple interest*, in which simple interest only is reckoned upon the purchase-money, and simple interest on each annuity from the time of payment, is so manifestly unequitable, as to be universally rejected; and the supposition which is now generally admitted in practice, is the highest improvement possible on both sides, viz. by compound interest. As the taking compound interest is prohibited by law, the realizing of this supposed improvement requires punctual payment of interest, and therefore the interest in such calculations is usually made low. Even with this advantage, it can hardly be rendered effectual in its full extent; it is however universally acquiesced in, as the most proper foundation of general rules; and when peculiar circumstances require any different hypothesis, a suitable calculation may be made.

Let then the annuity be called a, and let p be the present worth of it or purchase-money, t the time of its continuance, and let the other letters denote as formerly.

The seller, by improving the price received p, at compound interest, at the time the annuity ceases, has pR^t.

The purchaser is supposed to receive the first annuity a at the end of the first year, which is improved by him for $t-1$ years; it becomes therefore (Th. 2.) aR^{t-1}.

He receives the 2d annuity at the end of the 2d year, and when improved $t-2$, it becomes aR^{t-2}.

The third annuity becomes aR^{t-3}, &c.

The last annuity is simply a, therefore the whole amount of the improved annuities is the geometrical series $a+aR+aR^2$, &c. . . aR^{t-1}. The sum of this series, by Chap. VI. Sect. 2. is $a\times\frac{R^t-1}{R-1}=a\times\frac{R^t-1}{r}$.

But, from the nature of the problem, $pR^t=a\times\frac{R^t-1}{r}$,

and hence $p=a\times\frac{R^t-1}{rR^t}=a\times\frac{1-\frac{1}{R^t}}{r}$.

The same conclusion results from calculating the present worth of the several annuities, considered as sums payable in reversion.

Cor. 1. Of the four p, a, R, t, any three being given, the fourth may be found, by the solution of equations; t is found easily by logarithms, R or r can be found only by resolving an adfected equation of the t order.

Cor. 2. If an annuity has been unpaid for the term t, the arrear, reckoning compound interest, will be $a\times\frac{R^t-1}{r}$.

Cor. 3. The present worth of an annuity in reversion, that is to commence after a certain time (n), and then to continue t years, is found by subtracting the present worth for n years from the present worth for $n+t$ years, and then

$$p=a\times\frac{R^t-1}{rR^{t+n}}=a\times\frac{1-\frac{1}{R^t}}{rR^n}.$$

Also of R, t, n, a, p, any four being given, the fifth may be found.

Cor. 4. If the annuity is to continue for ever, then R^t-1 and R^t may be considered as the same; and $p=a\times\frac{R^t-1}{rR^t}=\frac{a}{r}$.

Cor. 5. A perpetuity in reversion (by *Cor.* 3.) since $R^t-1=R^t$, is $p=\frac{a}{rR^n}$.

Prob. When 12 years of a lease of 21 were expired, a renewal for the same term was granted for 1000l.; 8 years are now expired, and for what sum must a corresponding renewal be made, reckoning 5 *per cent.* compound interest?

From the first transaction the yearly profit rent must be deduced; and from this the proper fine in the second may be computed.

In the first bargain, an annuity in reversion for 12 years, to commence 9 years hence, was sold for 1000l. the annuity will therefore be found by *Cor.* 3. in which all the quantities are given, but $a=p+\frac{rR^n}{1-\frac{1}{R^t}}$.

and by inserting numbers, viz. $p=1000$, $t=12$, $n=9$, $r=.05$, and $R=1.05$; and working by logarithms $a=175.029=175l.-7d.$

Next, having found a, the second renewal is made by finding the present worth of the annuity a in reversion, to commence 13 years hence, and to last 8 years. In the canon (*Cor.* 3.) insert for a 175.029, and let $t=8$, $n=13$, and $r=.05$ as before, $p=599.93=599l.$ 18s. $6\frac{1}{2}$d. The fine required.

As these computations often become troublesome, and are of frequent use, all the common cases are calculated in tables, from which the value of any annuity for any time, at any interest, may easily be found.

It is to be observed also, that the preceding rules are computed on the supposition of the annuities being paid yearly; and therefore, if they be supposed to be paid half yearly, or quarterly, the conclusions will be somewhat different, but they may be easily calculated on the preceding principles.

The calculations of life annuities, depend partly upon the principles now explained, and partly on physical principles, from the probable duration of human life, as deduced from bills of mortality.

PART

PART II.

Of the General Properties and Resolutions of EQUATIONS of all Orders.

CHAP. I

Of the Origin and Composition of Equations; and of the Signs and Coefficients of their terms.

IN order to resolve the higher orders of equations, and to investigate their general affections, it is proper first to consider their origin from the combination of inferior equations.

As it would be impossible to exhibit particular rules for the solution of every order of equations, their number being indefinite; there is a necessity of deducing rules from their general properties, which may be equally applicable to all.

In the application of algebra to certain subjects, and especially to geometry, there may be an opposition in the quantities, analogous to that of addition and subtraction, which may therefore be expressed by the signs + and —. Hence these signs may be understood by abstraction, to denote contrariety in general; and therefore, in this method of treating of equations, negative roots are admitted as well as positive. In many cases the negative will have a proper and determinate meaning; and when the equation relates to magnitude only, where contrariety cannot be supposed to exist, these roots are neglected, as in the case of quadratic equations formerly explained. There is besides this advantage in admitting negative roots, that both the properties of equations from which their resolution is obtained, and also those which are useful in the many extensive applications of algebra, become more simple and general, and are more easily deduced.

In this general method, all the terms of any equation are brought to one side, and the equation is expressed by making them equal to o. Therefore, if a root of the equation be inserted instead of (x) the unknown quantity, the positive terms will be equal to the negative, and the whole must be equal to o.

Def. When any equation is put into this form, the term in which (x) the unknown quantity, is of the highest power, is called the *First*; that in which the index of x is less by 1, is the *Second*, and so on, till the last, into which the unknown quantity does not enter, and which is called the *Absolute* Term.

Prop. I. If any number of equations be multiplied together, an equation will be produced, of which the dimension (A) is equal to the sum of the dimensions of the equations multiplied.

If any number of simple equations be multiplied together, as $x-a=o$, $x-b=o$, $x-c=o$, &c. it is obvious, that the product will be an equation of a dimension, containing as many units as there are simple equations. In like manner, if higher equations are multiplied together, as a cubic and a quadratic, one of the fifth order is produced, and so on.

Conversely. An equation of any dimension is considered as compounded either of simple equations, or of others, such that the sum of their dimensions is equal to the dimension of the given one. By the resolution of equations these inferior equations are discovered, and by investigating the component simple equations, the roots of any higher equation are found.

Cor. 1. Any equation admits of as many solutions, or has as many roots as there are simple equations which compose it, that is, as there are units in the dimension of it.

Cor. 2. And conversely, no equation can have more roots than the units in its dimension.

Cor. 3. Imaginary or impossible roots must enter an equation by pairs; for they arise from quadratics, in which both the roots are such.

Hence also, an equation of an even dimension may have all its roots, or any even number of them impossible, but an equation of an odd dimension must at least have one possible root.

Cor. 4. The roots are either positive or negative, according as the roots of the simple equations, from which they are produced, are positive or negative.

Cor. 5. When one root of an equation is discovered, one of the simple equations is found, from which the given one is compounded. The given equation, therefore, being divided by this simple equation, will give an equation of a dimension lower by 1. Thus, any equation may be depressed as many degrees as there are roots found by any method whatever

Prop. II. To explain the general properties of the signs and coefficients of the terms of an equation.

Let $x-a=o$, $x-b=o$, $x-c=o$, $x-d=o$, &c. be simple equations, of which the roots are any positive quantities $+a$, $+b$, $+c$, $+d$, &c. and let $x+m=o$, $x+n=o$, &c. be simple equations, of which the roots are any negative quantities $-m$, $-n$, &c. and let any number of these equations be multiplied together, as in the following table:

$$\begin{array}{l} x-a=o \\ \times\, x-b=o \\ \hline \left.\begin{array}{l} =x^2-ax \\ \quad -bx+ab \end{array}\right\} =o, \text{ a Quadratic.} \\ \times\, x-c=o \\ \hline \end{array}$$

(A) The term *dimension*, in this treatise, is used in senses somewhat different, but so as not to create any ambiguity. In this chapter it means either the order of an equation, or the number denoting that order, which was formerly defined to be the highest exponent of the unknown quantity in any term of the equation.

Of Equations.

$$= x^3 \left.\begin{array}{r} -a \\ -b \\ -c \end{array}\right\} \times x^2 \left.\begin{array}{r} +ab \\ +ac \\ +bc \end{array}\right\} \times x - abc = 0, \text{ a Cubic.}$$

$$\times \quad +m = 0$$

$$= x^4 \left.\begin{array}{r} -a \\ -b \\ -c \\ +m \end{array}\right\} \times x^3 \left.\begin{array}{r} +ab \\ +ac \\ +bc \\ -am \\ -bm \\ -cm \end{array}\right\} \times x^2 \left.\begin{array}{r} -abc \\ +abm \\ +acm \\ +bcm \end{array}\right\} \times x - abcm = 0, \text{ a (Biquadratic,}$$

&c.

From this table it is plain,

1. That in a complete equation the number of terms is always greater by unit than the dimension of the equation.

2. The coefficient of the first term is 1.

The coefficient of the second term is the sum of all the roots (a, b, c, m, &c.) with their signs changed.

The coefficient of the third term is the sum of all the products that can be made by multiplying any two of the roots together.

The coefficient of the fourth term is the sum of all the products which can be made by multiplying together any three of the roots with their signs changed; and so of others.

The last term is the product of all the roots, with their signs changed.

3. From induction it appears, that in any equation (the terms being regularly arranged as in the preceding example) there are as many positive roots as there are changes in the signs of the terms from + to —, and from — to +; and the remaining roots are negative. The rule also may be demonstrated.

Note. The impossible roots in this rule are supposed to be either positive or negative.

In this example of a numeral equation $x^4-10x^3+35x^2-50x+24=0$, the roots are, $+1$, $+2$, $+3$, $+4$, and the preceding observations with regard to the signs and coefficients take place.

Cor. If a term of an equation is wanting, the positive and negative parts of its coefficient must then be equal. If there is no absolute term, then some of the roots must be $=0$, and the equation may be depressed by dividing all the terms by the lowest power of the unknown quantity in any of them. In this case also, $x-0=0$, $x-0=0$, &c. may be considered as so many of the component simple equations, by which the given equation being divided, it will be depressed so many degrees.

CHAP. II.

Of the Transformation of Equations.

There are certain transformations of equations necessary towards their solution; and the most useful are contained in the following propositions.

Prop. 1. The affirmative roots of an equation become negative, and the negative become affirmative, by changing the signs of the alternate terms, beginning with the second.

Thus the roots of the equation $x^4-x^3-19x^2+49x-30=0$ are $+1$, $+2$, $+3$, -5, whereas the roots of the equation $x^4+x^3-19x^2-49x-30=0$, are -1, -2, -3, $+5$.

Of Equations.

The reason of this is derived from the composition of the coefficients of these terms, which consist of combinations of odd numbers of the roots, as explained in the preceding Chapter.

Prop. 2. An equation may be transformed into another that shall have its roots greater or less than the roots of the given equation by some given difference.

Let x be the unknown quantity of the equation, and e the given difference; let $y=x\pm e$, then $x=y\mp e$; and if for x and its power in the given equation, $y\mp e$ and its powers be inserted, a new equation will arise, in which the unknown quantity is y, and its value will be $x\pm e$; that is, its roots will differ from the roots of the given equation by e.

Let the equation proposed be $x^3-px^2+qx-r=0$, of which the roots must be diminished by e. By inserting for x and its powers $y+e$ and its powers, the equation required is,

$$\left.\begin{array}{r} y^3+3ey^2+3e^2y+e^3 \\ -py^2-2pey-pe^2 \\ +qy+qe \\ -r \end{array}\right\} = 0$$

Cor. 1. From this transformation, the second, or any other intermediate term, may be taken away; granting the resolution of equations.

Since the coefficients of all the terms of the transformed equation, except the first, involve the powers of e and known quantities only, by putting the coefficient of any term equal to 0, and resolving that equation, a value of e may be determined; which being substituted, will make that term to vanish.

Thus, in this example, to take away the second term, let its coefficient, $3e-p=0$, and $e=\frac{1}{3}p$, which being substituted for e, the new equation will want the second term. And universally, the coefficient of the first term of a cubic equation being 1, and x being the unknown quantity, the second term may be taken away by supposing $x=y\pm\frac{1}{3}p$, $\mp p$ being the coefficient of that term.

Cor. 2. The second term may be taken away by the solution of a simple equation, the third by the solution of a quadratic, and so on.

Cor. 3. If the second term of a quadratic equation be taken away, it will become a pure equation, and thus a solution of qudratics will be obtained, which coincides with the solution already given in Part I.

Cor. 4. The last term of the transformed equation is the same with the given equation, only having e in place of x.

Prop. 3. In like manner may an equation be transformed into another, of which the roots shall be equal to the roots of the given equation, multiplied or divided by a given quantity.

Let x be the unknown letter in the given equation, and y that of the equation wanted; also let e be the given quantity.

To multiply the roots let $xe=y$ and $x=\frac{y}{e}$.

To divide the roots let $\frac{x}{e}=y$, and $x=ye$.

Then

Then substitute for x and its powers, $\frac{y}{e}$ or ye and its powers, and the new equation of which y is the unknown quantity will have the property required.

Cor. 1. By this proposition an equation, in which the coefficient of the first term is any known quantity, as a, may be transformed into another, in which the coefficient of the first term shall be unit. Thus, let the equation be $ax^3 - p^2 + qx - r = 0$. Suppose $y = ax$, or $x = \frac{y}{a}$, and for x and its powers insert $\frac{y}{a}$ and its powers, and the equation becomes $\frac{y^3}{a^2} - \frac{py^2}{a^2} + \frac{qy}{a} - r = 0$, or $y^3 - py^2 + qay - a^2r = 0$. Also, let the equation be $5x^3 - 6x^2 + 7x - 30 = 0$; and if $x = \frac{y}{5}$, then $y^3 - 6y^2 + 35y - 750 = 0$.

Cor. 2. If the two transformations in Prop. 2. and 3. be both required, they may be performed either separately or together.

Thus, if it is required to transform the equation $ax^3 - px^2 + qx - r = 0$ into one which shall want the second term, and in which the coefficient of the first term shall be 1; let $x = \frac{y}{a}$, and then $y^3 - py^2 + qay - a^2r = 0$ as before; then let $y = z + \frac{1}{3}p$, and the new equation, of which z is the unknown quantity, will want the second term, and the coefficient of z^3, the highest term is 1. Or, if $x = \frac{z + \frac{1}{3}p}{a}$, the same equation as the last found will arise from one operation.

Ex. Let the equation be $5x^3 - 6x^2 + 7x - 30 = 0$. If $x = \frac{y}{5}$, then $y^3 - 6y^2 + 35y - 750 = 0$. And if $y = z + 2$, $z^3 + 23z - 696 = 0$. Also, at once, let $x = \frac{z+2}{5}$, and the equation properly reduced, by bringing all the terms to a common denominator, and then casting it off, will be $z^3 + 23z - 696 = 0$, as before.

Cor. 3. If there are fractions in an equation, they may be taken away, by multiplying the equation by the denominators, and by this proposition the equation may then be transformed into another, without fractions, in which the coefficient of the first term is 1. In like manner may a surd coefficient be taken away in certain cases.

Cor. 4. Hence also, if the coefficient of the second term of a cubic equation is not divisible by 3, the fractions thence arising in the transformed equation, wanting the second term, may be taken away by the preceding corollary. But the second term also may be taken away, so that there shall be no such fractions in the transformed equation, by supposing $x = \frac{z \pm p}{3}$, $\pm p$ being the coefficient of the second term of the given equation. And if the equation $ax^3 - px^2 + qx - r = 0$ be given, in which p is not divisible by 3, by supposing $x = \frac{x+p}{3a}$, the transformed equation reduced is $z^3 - \overline{3p^2 + 9aq} \cdot \times z - 2p^3 + 9apq - 27a^2r = 0$; wanting the second term, having one for the coefficient of the first term, and the coefficients of the other terms being all integers, the coefficients of the given equation being also supposed integers.

General Corollary to Prop. 1. 2. 3.

If the roots of any of these transformed equations be found by any method, the roots of the original equation, from which they were derived, will easily be found from the simple equations expressing their relation. Thus, if 8 is found to be a root of the transformed equation $z^3 + 23z - 696 = 0$ (Cor. 2. prop. 3.) Since $x = \frac{z+2}{5}$, the corresponding root of the given equation $5x^3 - 6x^2 + 7x - 30 = 0$ must be $\frac{8+2}{5} = 2$. It is to be observed also, that the reasoning in Prop. 2. and 3. and the corollaries, may be extended to any order of equations, though in them it is applied chiefly to cubics.

CHAP. III.

Of the Resolution of Equation.

From the preceding principles and operations, rules may be derived for resolving equations of all orders.

I. Cardan's *Rule for Cubic Equation.*

The second term of a cubic equation being taken away, and the coefficient of the first term being made 1, (by Cor. 1. Prop. 2. and Cor. 1. Prop. 3. Chap. II.) it may be generally represented by $x^3 * + 3qx + 2r = 0$; the sign + in all terms denoting the addition of them, with their proper signs. Let $x = m + n$, and also $mn = -q$; by the substitution of these values, an equation of the 6th order, but of the quadratic form, is deduced, which gives the values of m and n; and hence,

$$(m+n=)\ x = \sqrt[3]{-r+\sqrt{r^2+q^3}} + \sqrt[3]{-r-\sqrt{r^2+q^3}};$$

$$\text{or } x = \sqrt[3]{-r+\sqrt{r^2+q^3}} - \frac{q}{\sqrt[3]{-r+\sqrt{r^2+q^3}}}.$$

Cor. 1. In the given equation, if $3q$ is negative, and if r^2 is less than q^3, this expression of the root involves impossible roots; while, at the same time, all the roots of that equation are possible. The reason is, that in this method of solution it is necessary to suppose that x the root may be divided into two parts, of which the product is q. But it is easy to show, that in this, which is called the *irreducible case*, it cannot be done.

For example, the equation (Ex. 3. Sect. 3. of this Chapter), $x^3 - 156 + 560 = 0$, belongs to the irreducible case, and the three roots are $+4$, $+10$, -14; and it is plain that none of these roots can be divided into two parts (m and n), of which the product can be equal to $(-q=)\ \frac{156}{3} = 52$; for the greatest product from the division of the greatest root -14, is $-7 \times -7 = 49$ less than 52.

If the cube root of the compound surd can be extracted, the impossible parts balance each other, and the true root is obtained.

The geometrical problem of the trisection of an arch

Of Equations.

arch is resolved algebraically, by a cubic equation of this form; and hence the foundation of the rule for resolving an equation belonging to this case, by a table of sines.

Cor. 2. Biquadratic equations may be reduced to cubics, and may therefore be resolved by this rule.

Some other classes of equations, too, may be resolved by particular rules; but these, and every other order of equations, are commonly resolved by the general rules, which may be equally applied to all.

II. *Solution of Equations, whose Roots are commensurate.*

Rule 1. All the terms of the equation being brought to one side, find all the divisors of the absolute term, and substitute them successively in the equation for the unknown quantity. That divisor which, substituted in this manner, gives the result $=0$, shall be a root of the equation.

$$Ex.\ 1.\ \left.\begin{array}{l} x^3-3ax^2+2a^2x-2a^2b \\ -bx^2\ +3abx \end{array}\right\}=0.$$

The simple literal divisors of $-2a^2b$ are a, b, $2a$, $3b$, any of which may be inserted for x. Supposing $x=+a$, the equation becomes

$$\left.\begin{array}{l} a^3-3a^3+2a^3-2a^2b \\ -ba^2+3a^2b \end{array}\right\}\text{which is obviously}=0.$$

$$Ex.\ 2.\ x^3-2x^2-33x+90=0.$$

The divisors of 90 are 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, 90.

The first of these divisors, which being inserted for x, will make the result $=0$, is $+3$; $+5$ is another; and it is plain the last root must be negative, and it is -6.

When 3 is discovered to be a root, the given equation may be divided by $x-3=0$, and the result will be a quadratic, which being resolved will give the other two roots, $+5$ and -6.

The reason of the rule appears from the property of the absolute term formerly defined, viz. that it is the product of all the roots.

To avoid the inconvenince of trying many divisors, this method is shortened by the following

Rule 2. Substitute in place of the unknown quantity successively three or more terms of the progression, 1, 0, -1, &c. and find all the divisors of the sums that result; then take out all the arithmetical progressions that can be found among these divisors whose common difference is 1, and the values of x will be among those terms of the progressions which are the divisors of the result arising from the substitution of $x=0$. When the series increases, the roots will be positive; and when it decreases, the roots will be negative.

Examp. Let it be required to find a root of the equation $x^3-x^2-10x+6=0$.

The operation is thus:

Supposit.		*Result.*	*Divisors.*	*Ar. pro.*
$x=1$		-4	1, 2, 4,	4
$x=0$	$x^3-x^2-10x+6=$	$+6$	1, 2, 3, 6,	3
$x=-1$		$+14$	1, 2, 7, 14,	2

In this example there is only one progression, 4, 3, 2; and therefore 3 is a root, and it is -3, since the series decreases.

It is evident by the rules for transforming equations (Chap. II.), that by inserting for x, $+1$ $(=+e)$ the result is the absolute term of an equation of which the roots are less than the roots of the given equation by 1 $(=e)$. Cor. 4. Prop. 2. When $x=0$ the result is the absolute term of the given equation. When for x is inserted -1 $(=-e)$ the result is the absolute term of an equation whose roots exceed the roots of the given equation by 1 $(=e)$. Hence, if the terms of the series 1, 0, -1, -2, &c. be inserted successively for x, the results will be the absolute terms of so many equations, of which the roots form an increasing arithmetical series with the difference 1. But as the commensurate roots of these equations must be among the divisors of their absolute terms, hence they must be among the arithmetical progressions found by this rule. The roots of the given equation therefore are to be sought for among the terms of these progressions which are divisors of the result, upon the supposition of $x=0$, because that result is its absolute term.

It is plain that the progressions must always be increasing, only it is to be observed, that a decreasing series with the sign + becomes increasing with the sign $-$. Thus, in the preceding example, -4, -3, -2, is an increasing series, of which -3 is to be tried, and it succeeds.

If, from the substitution of three terms of the progression, 1, 0, -1, &c. there arise a number of arithmetical serieses. by substituting more terms of that progression, some of the serieses will break off, and, of course, fewer trials will be necessary.

III. *Examples of Questions producing the higher Equations.*

Eamp. 1. It is required to divide 16 l. between two persons, so that the cube of the one's share may exceed the cube of the other's by 386.

Let the greater share be x pounds,
And the less will be $16-x$;

By the question, $x^3-\overline{16-x}|^3=386$
And by Inv. $2x^3-48x^2+768x-4096=386$
Transp. and divide $x^3-24x^2+384x-2241=0$.

	Suppos.	*Results.*	*Divisors.*
If	$x=\ 1$;	1880	1, 2, 4, 5, 8, 10, 20.
	$x=\ 0$;	2241	1, 3, 9, 27, 83.
	$x=-1$;	2650	1, 2, 5, 10, 25, 53.

Where 8, 9, 10, differ by 1; therefore $+9$ is to be tried; and being inserted for x, the equation is $=0$. The two shares then are 9 and 7 which succeed.

Since

Since $x=9$; $x-9=0$, is one of the simple equations from which this cubic is produced, therefore $\frac{x^3-24x^2+384x-2241}{x-9}=x^2-15x+249=0$. And the two roots of this quadratic are impossible.

Examp. 2. What two numbers are those whose product multiplied by the greater will produce 405, and their difference multiplied by the less 20?

Let the greater number be x, and the less y.

Then by quest. $\begin{cases}(xy\times x=)x^2y=405\\(x-y\times y=)xy-y^2=20\end{cases}$

Therefore - - - - $x=\frac{y^2+20}{y}$

And - - - - - - $x^2=\frac{y^4+40y^2+400}{y^2}$

Also - - - - - - $x^2=\frac{405}{y}$

Therefore $\frac{y^4+40y^2+400}{y^2}=\frac{405}{y}$

Mult. and transp. $y^4+40y^2-405y+400=0$.

This biquadratic, resolved by divisors, gives $y=5$: and therefore $x=9$. Also $\frac{y^4+40y^2-405y+400}{y-5}=y^3+5y^2+65y-80=0$.

This cubic equation has one positive incommensurate root, viz. 1.114, &c. which may be found by the rule in the next section, and two impossible. The incommensurate root $y=1.114$, &c. gives $x=19.067$, &c. and these two answer the conditions very nearly.

Examp. 3. The sum of the squares of two numbers 208, and the sum of their cubes 2240 being given, to find them.

Let the greater be $x+y$, and the less $x-y$.

Then $\overline{x+y}|^2+\overline{x-y}|^2=2x^2+2y^2=208$

Hence $y^2=104-x^2$

Also $\overline{x+y}|^3+\overline{x-y}|^3=2x^3+6xy^2=2240$

Substitute for y^2 its value and $2x^3+624x-6x^3=2240$.

This reduced gives $x^3-156x+560=0$.

The roots of this equation are $+10$, $+14$, -14. If $x=10$, then $y=2$; and the numbers sought are 12 and 8, which give the only just solution. If $x=4$, then $y^2=88$ and $y=\sqrt{88}$. The numbers sought are therefore $4+\sqrt{88}$ and $4-\sqrt{88}$. The last is negative, but they answer the conditions. Lastly, if $x=-14$, then $y^2=-92$, hence $y=\sqrt{-92}$, is impossible; but still the two numbers $-14+\sqrt{-92}$, $-14-\sqrt{-92}$, being inserted, would answer the conditions. But it has been frequently observed, that such solutions are both useless and without meaning.

IV. *Solution of Equations by Approximation.*

By the former rules, the roots of equation, when they are commensurate may be obtained. These, however, more rarely occur; and when they are incommensurate, we can find only an approximate value of them, but to any degree of exactness required. There are various rules for this purpose; one of the most simple is that of Sir Isaac Newton, which shall be now explained.

Lemma. If any two numbers, being inserted for the unknown quantity (x) in any equation, give results with opposite signs, an odd number of roots must be between these numbers.

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This appears from the property of the absolute term, and from this obvious maxim, that if a number of quantities be multiplied together, and if the signs of an odd number of them be changed, the sign of the product is changed. For, when a positive quantity is inserted for x, the result is the absolute term of an equation whose roots are less than the roots of the given equation by that quantity (Prop. 2. Cor. 3. Chap. II.) If the result has the same sign as the given absolute term, then from the property of the absolute term (Prop. 2. Chap. I.) either none or an even number only of the positive roots, have had their signs changed by the transformation; but if the result has an opposite sign to that of the given absolute term, the signs of an odd number of the positive roots must have been changed. In the first case, then, the quantity substituted must have been either greater than each of an even number of the positive roots of the given equation, or less than any of them; in the second case, it must have been greater than each of an odd number of the positive roots. An odd number of the positive roots, therefore, must lie between them when they give results with opposite signs. The same observation is to be extended to the substitution of negative quantities and the negative roots.

From this lemma, by means of trials, it will not be difficult to find the nearest integer to a root of a given numeral equation. This is the first step towards the approximation; and both the manner of continuing it, and the reason of the operation, will be evident from the following example.

Let the equation be $x^3-2x-5=0$.

1. Find the nearest integer to the root. In this case a root is between 2 and 3; for these numbers being inserted for x, the one gives a positive, and the other a negative, result. Either the number above the root, or that below it, may be assumed as the first value; only it will be more convenient to take that which appears to be nearest to the root, as will be manifest from the nature of the operation.

2. Suppose $x=2+f$, and substitute this value of x in the equation.

$$\begin{aligned}x^3&=8+12f+6ff+f^3\\-2x&=-4-2f\\-5&=-5\\\hline x^3-2x-5&=-1+10f+6f^2+f^3=0.\end{aligned}$$

As f is less than unit, its powers f^2 and f^3 may be neglected in this first approximation, and $10f=1$, or $f=0.1$ nearly, therefore $x=2.1$ nearly.

3. As $f=0.1$ nearly, let $f=.1+g$, and insert this value of f in the preceding equation.

$$\begin{aligned}f^3&=0.001+0.03g+0.3g^2+g^3\\6f^2&=0.06+1.2g+6g^2\\10f&=1\quad+10g\\-1&=-1\\\hline f^3+6f^2+10f-1&=0.061+11.23g+6.3g^2+g^3=0\end{aligned}$$

and neglecting g^2 and g^3, as very small $0.61+11.23g=0$,

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$=0$, or $g=\frac{-0.061}{11.23}=-.0054$, hence $f=0.1+g=.0946$ nearly, and $x=2.0946$ nearly.

4. This operation may be continued to any length, as by supposing $g=-.0054+h$, and so on, and the value of $x=2.09455147$ nearly.

By the first operation a nearer value of x may be found thus; since $f=.1$ nearly and $-1+10f+6f^2+f^3=0$, $f=\frac{1}{10+6f+f^2}$, that is, $f=\frac{1}{10+.6+.01}=.094$ true to the last figure, and $x=2.094$.

In the same manner may the root of a pure equation be found, and this gives an easy method of approximating to the roots of numbers which are not perfect powers.

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This rule is applicable to numeral equations of every order; and, by assuming a general equation, general rules may be deduced for approximating to the roots of any proposed equation. By a similar method we may approximate to the roots of literal equations, which will be expressed by infinite series.

PART III.

Of the Application of ALGEBRA to GEOMETRY.

CHAP. I.

General Principles.

GEOMETRY treats both of the magnitude and position of extension, and their connections.

Algebra treats only of magnitude; therefore, of the relations which subsist in geometrical figures, those of magnitude only can be immediately expressed by algebra.

The opposite position of straight lines may indeed be expressed simply by the signs $+$ and $-$. But, in order to express the various other positions of geometrical figures by algebra from the principles of geometry, some relations of magnitude must be found, which depend upon these positions, and which can be exhibited by equations: And, conversely, by the same principles may the positions of figures be inferred from the equations denoting such relations of their parts.

Though this application of algebra appears to be indirect, yet such is the simplicity of the operations, and the general nature of its theorems, that investigations, especially in the higher parts of geometry, are generally easier and more expeditious by the algebraical method, though less elegant than by what is purely geometrical. The connections also, and analogies of the two sciences established by this application, have given rise to many curious speculations. Geometry has been rendered far more extensive and useful, and algebra itself has received considerable improvements.

I. *Of the Algebraical Expression of Geometrical Magnitudes.*

A *line*, whether known or unknown, is represented by a single letter: a *rectangle* is properly expressed by the product of the two letters representing its sides: and a *rectangular parallelopiped* by the product of three letters; two of which represent the sides of any of its rectangular bases, and the third the altitude.

These are the most simple expressions of geometrical magnitudes; and any other which has a known proportion to these, may in like manner be expressed algebraically. Conversely, the geometrical magnitudes, represented by such algebraical quantities, may be found, only the algebraical dimensions above the third, not having any corresponding geometrical dimensions, must be expressed by proportionals (A).

The opposite position of straight lines, it has been remarked, may be expressed by the signs $+$ and $-$.

Thus, let a point A be given in the line

p A M P B

AP, any segment AP taken to the right hand being considered as positive, a segment Ap to the left is properly

(A) All algebraical dimensions above the third must be expressed by inferior geometrical dimensions; and though any algebraical quantities of two or three dimensions may be immediately expressed by surfaces and solids respectively, yet it is generally necessary to express them, and all superior dimensions, by lines.

If, in any geometrical investigation by algebra, each line is expressed by a single letter, and each surface or solid by an algebraical quantity of two or three dimensions respectively, then whatever legitimate operations are performed with regard to them, the terms in any equation derived will, when properly reduced, be all of the same dimension; and any such equation may be easily expressed geometrically by means or proportionals, as in the following example.

Thus, if the algebraical equation $a^4+b^4=c^4-d^4$, is to be expressed geometrically, a, b, c, d, being supposed to represent staight lines; let $a:b:e:f:g$, in continued proportion, then $a^4:b^4::a:g$ and $a^4:a^4+b^4::a:a+g$; then let $a:c:h:k:l$, and $a^4:c^4::a:l$; also, let $c:d:m:n:p$, and $c^4:d^4::c:p$, or $c^4:c^4-d^4::c:c-p$. By combining the two former proportions (Chap. II. Part I.), $c^4:a^4+b^4::l:a+g$, and combining the latter with this last found, c^4-d^4 $a^4+b^4::\overline{c-p}\times l:c\times\overline{a+g}$; therefore $\overline{c-p}\times l=c\times\overline{a+g}$, and $c:c-p::l:a+g$.

If

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perly represented by a negative quantity. If a and b represent two lines; and if, upon the line AB from the point A, AP be taken towards the right equal to a, it may be expressed by $+a$; then PM taken to the left and equal to b, will be properly represented by $-b$, for AM is equal to $a-b$. If $a=b$, then M will fall upon A, and $a-b=0$. By the same notation, if b is greater than a, M will fall to the left of A; and in this case, if $2a=b$, and if Pp be taken equal to b, then $(a-b=)\ -a$ will represent Ap, which is equal to a, and situated to the left of A. This use of the signs, however, in particular cases, may be precluded, or in some measure restrained.

The positions of geometrical figures are so various, that it is impossible to give general rules for the algebraical expression of them. The following are a few examples.

An angle is expressed by the ratio of its sine to the radius; a right angle in a triangle, by putting the squares of the two sides equal to the square of the hypothenuse; the position of points is ascertained by the perpendiculars from them on lines given in position; the position of lines by the angles which they make with given lines, or by the perpendiculars on them from given points; the similarity of triangles by the proportionality of their sides which gives an equation, &c.

These and other geometrical principles must be employed both in the demonstration of theorems and in the solution of problems. The geometrical proposition must first be expressed in the algebraical manner, and the result after the operation must be expressed geometrically.

II. *The Demonstration of Theorems.*

All propositions in which the proportions of magnitudes only are employed, also all propositions expressing the relations of the segments of a straight line, of their squares, rectangles, cubes, and parallelopipeds, are demonstrated algebraically with great ease. Such demonstrations, indeed, may in general be considered as an abridged notation of what are purely geometrical.

This is particularly the case in those propositions which may be geometrically deduced without any construction of the squares, rectangles, &c. to which they refer. From the first proposition of the second book of Euclid, the nine following may be easily derived in this manner, as they may be considered as proper examples of this most obvious application of algebra to geometry.

If certain positions are either supposed or to be inferred in a theorem, we must find, according to the preceding observations, the connection between these positions and such relations of magnitude as can be expressed and reasoned upon by algebra. The algebraical demonstrations of the 12th and 13th propositions of the 2d book of Euclid, require only the 47th of the I. El. The 35th and 36th of the 3d book require only the 3. III. El. and 47. I. El.

From a few simple geometrical principles alone, a number of conclusions, with regard to figures, may be deduced by algebra; and to this in a great measure is owing the extensive use of this science in geometry. If other more remote geometrical principles are occasionally introduced, the algebraical calculations may be much abridged. The same is to be observed in the solution of problems; but such in general are less obvious, and more properly belong to the strict geometrical method.

III. *Of the Solution of Problems.*

Upon the same principles are geometrical problems to be resolved. The problem is supposed to be constructed, and proper algebraical notations of the known and unknown magnitudes are to be sought for, by means of which their connections may be expressed by equations. It may first be remarked, as was done in the case of theorems, that in those problems which relate to the divisions of a line and the proportions of its parts, the expression of the quantities, and the stating their relations by equations, are so easy as not to require any particular directions. But when various positions of geometrical figures and their properties are introduced, the solution requires more attention and skill. No general rules can be given on this subject, but the following observations may be of use.

1. The construction of the problem being supposed, it is often farther necessary to produce some of the lines till they meet; to draw new lines joining remarkable points; to draw lines from such points perpendicular or parallel to other lines, and such other operations as seem conducive to the finding of equations; and for this purpose, those especially are to be employed which divide the scheme into triangles that are given, right angled or similar.

2. It is often convenient to denote by letters, not the quantities particularly sought, but some others from which they can easily be deduced. The same may be observed of given quantities.

3. The proper notation being made, the necessary equations are to be derived by the use of the most simple geometrical principles; such as the addition and subtraction of lines or of squares, the proportionality of lines, particularly of the sides of similar triangles, &c.

4. There must be as many independent equations as there are unknown quantities assumed in the investigation, and from these a final equation may be inferred by the rules of Part I.

If the final equation from the problem be resolved, the roots may often be exhibited geometrically; but the geometrical construction of problems may be ef-

 fected

If any known line is assumed as 1, as its powers do not appear, the terms of an equation, including any of them, may be of very different dimensions; and before it can be properly expressed by geometrical magnitudes, the deficient dimensions must be supplied by powers of the 1. When an equation has been derived from geometrical relations, the line denoting 1 is known; and when an assumed equation is to be expressed by the relations of geometrical magnitudes, the 1 is to be assumed.

In this manner may any single power be expressed by a line. If it is x^5, then to 1, x find four quantities in continued proportion; so that $1 : x : m : n : p : q$, then $1 : q :: 1^5 : x^5$, or $q = x^5$: and so of others.

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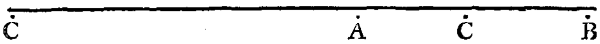
fected also without resolving the equation, and even without deducing a final equation, by the methods afterwards to be explained.

If the final equation is simple or quadratic, the roots being obtained by the common rules, may be geometrically exhibited by the finding of proportionals, and the addition or subtraction of squares.

By inserting numbers for the unknown quantities, a numeral expression of the quantities sought will be obtained by resolving the equation. But in order to determine some particulars of the problem besides finding the unknown quantities of the equation it may be farther necessary to make a simple construction; or, if it is required that every thing be expressed in numbers, to substitute a new calculation in place of that construction.

Prob. I. *To divide a given straight line* AB *into two parts, so that the rectangle contained by the whole line and one of the parts may be equal to the square of the other part.*

This is prop. 11th II. B. of Eucl.



Let C be the point of division, and let $AB=a$, $AC=x$, and then $CB=a-x$. From the problem $a^2-ax=x^2$; and this equation being resolved (Chap. V. P. II.) gives $x=\pm\sqrt{a^2+\frac{a^2}{4}}-\frac{a}{2}$

The quantity $\sqrt{a^2+\frac{a^2}{4}}$, is the hypothenuse of a right-angled triangle, of which the two sides are a and $\frac{a}{2}$, and is therefore easily found; $\frac{a}{2}$ being taken from this line, gives $x=AC$, which is the proper solution. But if a line AC be taken on the opposite side of A, and equal to the abovementioned hypothenuse, together with $\frac{a}{2}$, it will represent the negative root $-\sqrt{a^2+\frac{a^2}{4}}-\frac{a}{2}$, and will give another solution; for in this case also $AB\times BC=AC^2$. But C is without the line AB; and therefore, if it is not considered as making a division of AB, this negative root is rejected.

This solution coincides with what is given by Euclid. For $\sqrt{a^2+\frac{a^2}{4}}$ is equal (see the fig. of Prop. 11th II. B. Eucl. Simson's edit.) to EB or EF, and therefore $x=\sqrt{a^2+\frac{a^2}{4}}-\frac{a}{2}=EF-EA=AF=AH$; and the point H corresponds to C in the preceding figure.

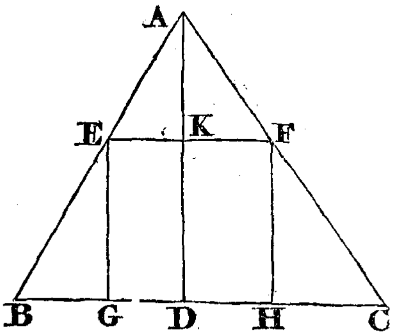
Besides, if on $(EF+EA=)$ CF (instead of $EF-EA=FA$) a square be described on the opposite side of CF from AG, BA produced will meet a side of it in a point; which if it be called K, will give $KB\times BA=KA^2$. K corresponds to C, and this solution will correspond with the algebraical solution by means of the negative root.

If CB had been called x, and $AC=a-x$, the equation would be $ax=a^2-2ax+x^2$, which gives $x=\frac{3a\pm\sqrt{5a^2}}{2}$, in which both roots are positive, and the solutions derived from them coincide with the preceding. If the solution be confined to a point within the line, then one of these positive roots must be rejected, for one of the roots of the compound square from which it is derived, $x-\frac{3a}{2}$, is a negative quantity which in this strict hypothesis is not admitted. In such a problem, however, both constructions are generally received, and considered even as necessary to a complete solution of it.

If a solution in numbers be required, let $AB=10$, then $x=\pm\sqrt{125}-5$. It is plain, whatever be the value of AB, the roots of this equation are incommensurate, though they may be found, by approximation, to any degree of exactness required. In this case, $x=\pm 11.1803-5$, nearly; that is $AC=6.1803$, nearly; and $AC=16.1803$, nearly.

Prob. II. *In a given Triangle* ABC *to inscribe a Square.*

Suppose it to be done, and let it be EFHG. From A let AD be perpendicular on the base BC, meeting EF in K.



Let $BC=a$, and $AD=p$, both of which are given because the triangle is given. Let AK be assumed as the unknown quantity, because from it the square can easily be constructed; and let it be called x. Then $(KD=EG=)$ $EF=p-x$.

On account of the parallels EF, BC, $AD:BC::AK\cdot EF$; that is, $p:a::x:p-x$, and $p^2-px=ax$, which equation being resolved, gives $x=\frac{p^2}{p+a}$.

Therefore x or AK is a third proportional to $p+a$ and p, and may be found by 11. VI. El. The point K being found, the construction of the square is sufficiently obvious.

Prob. III. *In the right-angled Triangle* ABC, *the Base* BC, *and the Sum of the Perpendicular and Sides* BA+AC+AD *being given, to find the Triangle.*

Such parts of this triangle are to be found as are necessary for describing it: The perpendicular AD will be sufficient for this purpose; and let it be called x: Let $AB+AC+AD=a$, $BC=b$; therefore $BA+AC=a-x$. Let

Application to Geometry.

Let BA—AC be denoted by y, then BA$=\frac{a+y-x}{2}$, and AC$=\frac{a-x-y}{2}$. But [47. I. El.] BC^2=BA^2+AC^2, which being expressed algebraically, becomes $b^2=\overline{\frac{a+y-x}{2}}\Big|^2+\overline{\frac{a-x-y}{2}}\Big|^2=\frac{a^2-2ax+x^2+y^2}{2}$. Likewise, from a known property of right-angled triangles, BC×AD=BA×AC; that is, $bx=\left(\frac{a+y-x}{2}\times\frac{a-y-x}{2}=\right)\frac{a^2-2ax+x^2-y^2}{4}$. This last equation being multiplied by 2, and added to the former, gives $b^2+2bx=a^2-2ax+x^2$, which being resolved according to the rules of Part I. Chap. V. gives $x=a+b-\sqrt{2ab+2b^2}$

To construct this: $a+b$ is the sum of the perimeter and perpendicular, and is given; $\sqrt{2ab+2b^2}=\sqrt{\overline{a+b}\times 2b}$ is a mean proportional between $a+b$ and $2b$, and may be found; therefore, from the sum of the perimeter and perpendicular subtract the mean proportional between the said sum and double the base, and the remainder will be the perpendicular required.

From the base and perpendicular the right-angled triangle is easily constructed.

In numbers, let BA+AC+AD$=18.8=a$; BC$=10=b$; then AD$=a+b-\sqrt{2ab+b^2}=28.8-\sqrt{576}=4.8=x$, and BA+AC$=14$. By either of the first equations $y^2=2b^2+2ax-a^2-x^2=4$ and y=BA—AC $=2$; therefore BA$=8$, and AC$=6$.

The geometrical expression of the roots of final equations arising from problems may be found without resolving them by the intersection of geometrical lines. Thus, the roots of a quadratic are found by the intersections of the circle and straight line, those of a cubic and biquadratic, by the intersections of two conic sections, &c.

The solution of problems may be effected also by the intersections of the *loci* of two intermediate equations without deducing a final equation. But these two last methods can only be understood by the doctrine of the *loci* of equations.

CHAP. II.

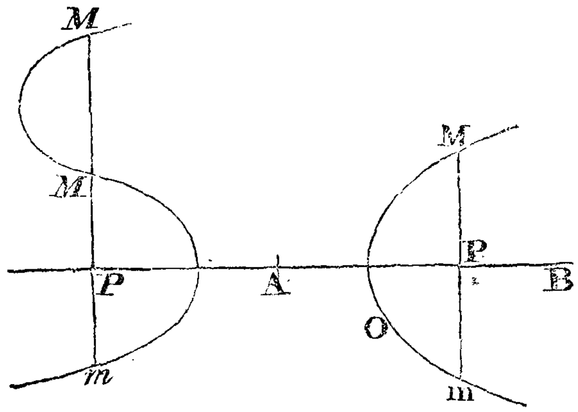
Of the Definition of Lines by Equations.

LINES which can be mathematically treated of must be produced according to an uniform rule, which determines the position of every point of them.

This rule constitutes the *definition* of any line from which all its other properties are to be derived.

A straight line has been considered as so simple as to be incapable of definition. The curve lines here treated of are supposed to be in a plane; and are defined either from the section of a solid by a plane, or more universally by some continued motion in a plane, according to particular rules. Any of the properties which are shown to belong peculiarly to such a line, may be assumed also as the definition of it, from which all the others, and even what upon other occasions may have been considered as the primary definition, may be demonstrated. Hence lines may be defined in various methods, of which the most convenient is to be determined by the purpose in view. The simplicity of a definition, and the ease with which the other properties can be derived from it, generally give a preference.

Definitions. 1. When curve lines are defined by equations, they are supposed to be produced by the extremity of one straight line, as PM moving in a given angle along another straight line AB given in position, which is called the base.



2. The straight line PM moving along the other, is called an *Ordinate*, and is usually denoted by y.

3. The segment of the base AP between a given point in it A, and an ordinate PM, is called an *Absciss* with respect to that ordinate, and is denoted by x. The ordinate and abscis together are called *Co-ordinates*.

4. If the relation of the variable abscis and ordinate AP and PM, be expressed by an equation, which besides x and y contains only known quantities, the curve MO described by the extremity of the ordinate, moving along the base, is called the *Locus* of that equation.

5. If the equation is finite, the curve is called *Algebraical* (A). It is this class only which is here considered.

6. The *dimensions* of such equations are estimated from the highest sum of the exponents of x and y in any term.—According to this definition, the terms x^4, x^3y, x^2y^2, xy^3, y^4 are all of the same dimension.

7. Curve lines are divided into *orders* from the dimensions of their equations, when freed from fractions and surds.

In these general definitions, the straight line is supposed to be comprehended, as it is the locus of simple equations. The loci of quadratic equations are shown to

(A) The terms *Geometrical* and *Algebraical*, as applied to curve lines, are used in different senses, by different writers; there are several other classes of curves besides what is here called algebraical, which can be treated of mathematically, and even by means of algebra. See Scholium at the end.

to be the conic sections, which are hence called lines of the second order, &c.

It is sufficiently plain from the nature of an equation, containing two variable quantities, that it must determine the position of every point of the curve, defined by it in the manner now described: for if any particular known value of one of the variable quantities as x be assumed, the equation will then have one unknown quantity only, and being resolved, will give a precise number of corresponding values of y, which determine so many points of the curve.

As every point of the locus of an equation has the same general property, it must be one curve only, and from this equation all its properties may be derived. It is plain also, that any curve line defined from the motion of a point, according to a fixed rule, must either return into itself, or be extended *ad infinitum* with a continued curvature.

The equation, however, is supposed to be irreducible; because, if it is not, the locus will be a combination of inferior lines: but the combination will possess the general properties of the lines of the order of the given equation.

It is to be observed all along that the positive values of the ordinate, as PM, being taken upwards, the negative Pm will be placed downwards, on the opposite side of the base: and if positive values of the abscis, as AP, be assumed to the right from its beginning, the negative values, *AP* will be upon the left, and from these the points of the curve *M*, *m*, on that side are to be determined.

In the general definition of curves it is usual to suppose the co-ordinates to be at right angles. If the locus of any equation be described, and if the abscis be assumed on another base, and the ordinate be placed at a different angle, the new equation expressing their relation though of different form, will be of the same order as the original equation; and likewise will have, in common with it, those properties which distinguish the equations of that particular curve.

This method of defining curves by equations may not be the fittest for a full investigation of the properties of a particular curve; but as their number is without limit, such a minute inquiry concerning all, would be not only useless, but impossible. It has this great advantage, however, that many of the general affections of all curves, and of the distinct orders, and also some of the most useful properties of particular curves, may be easily derived from it.

I. *The Determination of the Figure of a Curve from its Equations.*

The general figure of the curve may be found by substituting successively particular values of x the abscis, and finding by the resolution of these equations the corresponding values of y the ordinate, and of consequence so many points of the curve. If numeral values be substituted for x, and also certain numbers for the known letters, the resolution of the equation gives numeral expressions of the ordinates; and from these, by means of scales, a mechanical description of the curve will be obtained, which may often be useful, both in pointing out the general disposition of the figure, and also in the practical applications of geometry.

Some more general suppositions may be of use in determining the figure; but these can be suggested only from the particular form of the equation in view. By supposing x to have certain relations to the known quantities, the values of y may become more simple, and the equation may be reduced to such a form as to show the direction of the curve, and some of its obvious properties.

The following general observations may also be laid down:

1. If in any case a value of y vanishes, then the curve meets the base in a point determined by the corresponding value of x. Hence by putting $y=0$, the roots of the equation, which in that situation are values of x, will give the distances on the base from the point assumed as the beginning of x, at which the curve meets it.

2. If at a particular value of x, y becomes infinite, the curve has an infinite arc, and the ordinate at that point becomes an asymptote.

3. If when x becomes infinitely great, y vanishes, the base becomes an asymptote.

4. If any value of y becomes impossible, then so many intersections of the ordinate and curve vanish. If at any value of x all the values of y become impossible, the ordinate does not there meet the curve.

5. If two values of y become equal and have the same sign, the ordinate in that situation either touches the curve, or passes through an intersection of two of its branches, which is called a *punctum duplex*, or through an oval become infinitely little, called a *punctum conjugatum*.

In like manner is a *punctum triplex*, &c. to be determined.

The following example will illustrate this doctrine: Let the equation be $ay^2 - xy^2 = x^3 + bx^2$:

Therefore, $y^2 = \frac{x^3 + bx^2}{a-x}$ and $y = \pm\sqrt{\frac{x^3+bx^2}{a-x}}$

$$= \pm\sqrt{\frac{x+b}{a-x}} \times x.$$

Let AB be assumed as a base on which the abscisses are to be taken from A, and the ordinates perpendicular to it.

Since the two values of y are equal, but have opposite signs; PM, and Pm which represent them, must be taken equal to each other on opposite sides of AB; and it is plain that the parts of the curve on the two sides of AB, must be every way similar and equal.

If x is made equal to a, then $y = x\sqrt{\frac{x+b}{0}}$

which is an algebraical expression for infinity; therefore if AC is taken equal to a, the perpendicular CD will become an asymptote to the curve, which will have two infinite arcs (Obs. 2.). If x is greater than a, the quantity under the radical sign becomes negative, and the values of y are impossible; that is, no part of the curve lies beyond CD. (4.)

Both branches of the curve pass through A, since $y=0$, when $x=0$. (1.) Let x be negative, and $y = \pm x \sqrt{\frac{b-x}{a+x}}$; the values of y will be possible, if x is not greater than b; but if $x=b$, then $y=0$, and if x is greater

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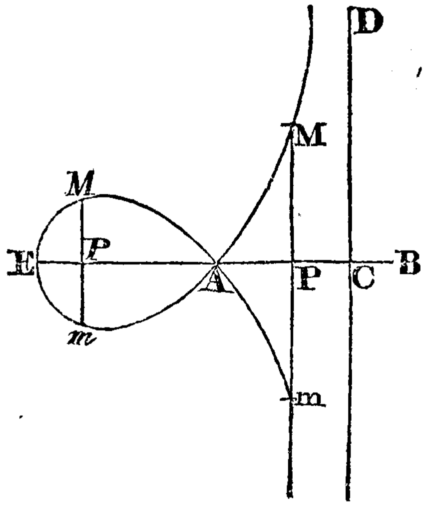
er than b, the values of y become impossible; that is, if the absciss AP be taken to the left of A, and less than b, there will be two real equal values of y, viz. PM, Pm on the opposite sides as before; if AE be taken equal to b the curve will pass through E, and no part of it is beyond E. (1. and 4.)



The portion between A and E is called a *Nodus*.

If y be put $=0$, then the values of x are 0, 0, $-b$. That is, the curve passes twice through A, or A is a punctum duplex, and it passes also through E as before. (1.)

The mechanical description of curves mentioned in the beginning of this section, may be illustrated by the preceding example. For this purpose, let any numeral values of a and b be assumed; and if successive numeral values of x be inserted, corresponding numeral values of y will be obtained, by which so many points in the curve may be constructed.

Let $AC=a=10$; $AE=b=12$; and, first let $x=1$, then $y=\pm x\sqrt{\dfrac{x+b}{a-x}}=\pm\dfrac{\sqrt{13}}{3}=\pm 1.2$ nearly, which gives the length of the ordinates when the absciss is 1; and in the same manner are the ordinates to be found when x is 2, 3, or any other number. Thus, if $x=6$, then $y=\pm 6\times\dfrac{\sqrt{18}}{2}=12.73$ nearly; and if AP be taken from the scale of equal parts (according to which AB and AE are supposed to be laid down) and equal to 6, then PM, Pm, being taken from the same scale, each equal to 12.73, will give the points of the curve M, m. In like manner, if $x=-y$, $y=\pm 9\sqrt{\dfrac{3}{19}}=\pm$ 3.58, nearly; and if $AP=9$, then PM, Pm being taken from the same scale equal to 3.58, will give the points M, m. In the same manner may any number of points be found, and these being joined, will give a representation of the curve, which will be more or less just, according to the number of points found, and the accuracy of the several operations employed.

By the same methods the locus of any other equation is to be traced: Thus, by varying the former equation, the figure of its locus will be varied. If $b=0$, then the point A and E coincide, the nodus vanishes, and A is called a *cuspis*.

If b is negative, then E is to the right of A, which will now be a punctum conjugatum. The rest of the curve will be between E and C, and CD becomes an assymptote.

If $a=0$ then $-xy^2=x^3-bx^2$ or $y^2=bx-x^2$, which is an equation to the circle of which $b=AE$ is the diameter.

II. *General Properties of Curves from their Equations.*

The general properties of equations lead to the general affections of curve lines. For Example,

A straight line may meet a curve in as many points as there are units in the dimension of its equation; for so many roots may that equation have. An asymptote may cut a curve line in as many points, excepting two, as it has dimensions, and no more. The same may be observed of the tangent.

Impossible roots enter an equation by pairs; therefore the intersections of the ordinate and curve must vanish by pairs.

The curves of which the number expressing the order is odd, must have at least two infinite arcs; for the absciss may be so assumed, that, for every value of it, either positive or negative, there must be at least one value of y, &c.

The properties of the coefficients of the terms of equations, mentioned Part II. Chap. I. furnish a great number of the curious and universal properties of curve lines. For example, the second term of an equation is the sum of the roots with the signs changed, and if the second term is wanting, the positive and negative roots must be equal. From this it is easy to demonstrate, "That if each of two parallel straight lines meet a curve line in as many points as it has dimensions, and if a straight line cut these two parallels, so that the sum of the segments of each on one side be equal to the sum of the segments on the other, this straight line will cut any other line parallel to these in the same manner." Analogous properties, with many other consequences from them, may be deduced from the composition of the coefficients of the other terms.

Many properties of a particular order of curves may be inferred from the properties of equations of that order. Thus, "If a straight line cut a curve of the third order in three points, and if another straight line be drawn, making a given angle with the former, and cutting the curve also in three points, the parallelopiped by the segments of one of these lines between its intersection with the other, and the points where it meets the curve, will be to the parallelopiped by the like segments of the other line in a given ratio." This depends upon the composition of the absolute term, and may be extended to curves of any order.

III. *The Subdivision of Curves.*

As lines are divided into orders from the dimensions of their equations, in like manner, from the varieties of the equations of any order, may different *genera* and *species* of that order be distinguished, and from the peculiar properties of these varieties, may the affections of the particular curves be discovered.

For this purpose a complete general equation is assumed of that order, and all the varieties in the terms and coefficients which can affect the figure of the locus are enumerated.

It

Application to Geometry.

It was formerly obferved, that the equations belonging to any one curve, may be of various forms, according to the pofition of the bafe, and the angle which the ordinate makes with it, though they be all of the fame order, and have alfo certain properties, which diftinguifh them from the other equations of that order.

The locus of fimple equations is a *ftraight line*. There are *three* fpecies of lines of the fecond order, which are eafily fhown to be the *conic fections*, reckoning the circle and ellipfe to be one. *Seventy-eight* fpecies have been numbered of the third order: And as the fuperior orders become too numerous to be particularly reckoned, it is ufual only to divide them into certain general claffes.

A complete arrangement of the curves of any order would furnifh canons, by which the fpecies of a curve whofe equation is of that order might be found.

IV. *Of the place of Curves defined from other principles in the Algebraical Syftem.*

If a curve line be defined from the fection of a folid, or from any rule different from what has been here fuppofed, an equation to it may be derived, by which its order and fpecies in the algebraical fyftem may be found. And, for this purpofe, any bafe and any angle of the co-ordinates may be affumed, from which the equation may be moft eafily derived, or may be of the moft fimple form.

The three *Conic Sections* are of the fecond order, as their equations are univerfally quadratic; the *Ciffoid* of the ancients is of the third order, and the 42d fpecies, according to Sir Ifaac Newton's enumeration; this is the curve defined by the equation in page 439, col. 1. par. ult. when $b=0$. The curve delineated above in the fame page, is the 41ft fpecies. When b is negative in that equation, the locus is the 43d fpecies. The *Conchoid* of Nicomedes is of the fourth order; the *Caffinian* curve is alfo of the fourth order, &c.

It is to be obferved, that not only the firft definition of a curve may be expreffed by an equation, but likewife any of thofe theorems called *loci*, in which fome property is demonftrated to belong to every point of the curve. The expreffion of thefe propofitions by equations, is fometimes difficult; no general rules can be given; and it muft be left to the fkill and experience of the learner.

Scholium.

This method of treating curve lines by equations, befides the ufes already hinted at, has many others, which do not belong to this place; fuch are, the finding the tangents of curves, their curvature, their areas and lengths, &c. The folution of thefe problems has been accomplifhed by means of the equations to curves, though by employing, concerning them, a method of reafoning different from what has been here explained.

CHAP. III.

I. *Conftruction of the Loci of Equations.*

The defcription of a curve, according to the definition of it, is affumed in geometry as a *poftulate*.

If the properties of a particular curve are inveftigated, it will appear that it may be defcribed from a variety of data different from thefe affumed in the poftulate, by demonftrating the dependence of the former upon the latter.

As the definitions of a curve may be various, fo alfo may be the poftulates, and a definition is frequently chofen from the mode of defcription connected with it. The particular object in view, it was formerly remarked, muft determine the proper choice of a definition; the fimplicity of it, the eafe with which the other properties of the figure may be derived from it, and fometimes even the eafe with which it can be executed mechanically, may be confidered as important circumftances.

In the ftraight line, the circle, the conic fections, and a few curves of the higher orders, the moft convenient definitions, and the poftulates connected with them, are generally known and received. An equation to a curve may alfo be affumed as a definition of it; and the defcription of it, according to that definition, may be confidered as a poftulate: but, if the geometrical conftruction of problems is to be inveftigated by means of algebra, it is often ufeful to deduce from the equation to a curve, thofe data which, from the geometrical theory of the curve, are known to be neceffary to its defcription in the original poftulate, or in any problem founded upon it. This is called *Conftructing the locus* of an equation, and from this method are generally derived the moft elegant conftructions which can be obtained by the ufe of algebra. In the following fection, there is an example of a problem refolved by fuch conftructions.

Sometimes a mechanical defcription of a curve line defined by an equation is ufeful; and as the exhibition of it, by fuch a motion as is fuppofed in that definition, is rarely practicable, it generally becomes neceffary to contrive fome more fimple motion which may in effect correfpond with the other, and may defcribe the curve with the degree of accuracy which is wanted. Frequently, indeed, the only method which can be conveniently practifed, is the finding a number of points in the curve by the refolution of numeral equations, in the manner mentioned in Sect. 1. of this Chapter, and then joining thefe points by the hand; and though this operation is manifeftly imperfect, it is on fome occafions ufeful.

II. *Solution of Problems.*

The folution of geometrical problems by algebra is much promoted, by defcribing the loci of the equations arifing from thefe problems.

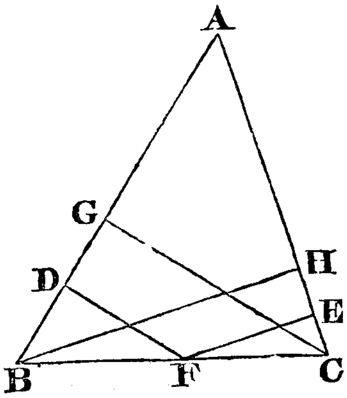
For this purpofe, equations are to be derived according to the methods formerly defcribed, and then to be reduced to two, containing each the fame two unknown quantities. The loci of thefe equations are to be defcribed, the two unknown quantities being confidered as the co-ordinates, and placed at the fame angle in both. The co-ordinates at the interfection of the loci, will be common to both, and give a folution of the problem.

The fimplicity of a conftruction obtained by this method, will depend upon a proper notation, and the choice of the equations of which the loci are to be defcribed. Thefe will frequently be different from what would be proper in a different method of folution.

Prob.

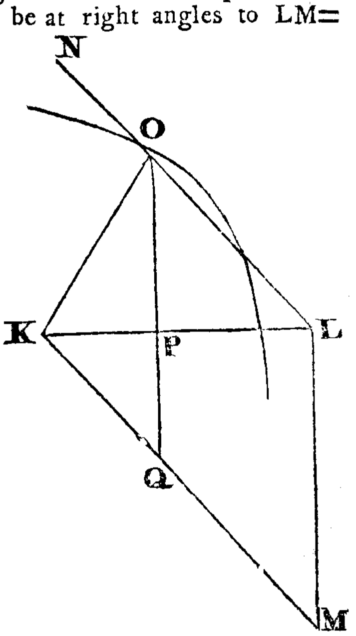
PROB. IV. *To find Point F in the Base of the given Triangle ABC, so that the Sum of the Squares of FE, FD drawn from it perpendicular upon the two Sides, may be equal to a given Space.*

Draw BH, CG perpendicular on the two sides, and let $FD=x$, $FE=y$, $BF=z$, $BC=b$, $BH=p$, $CG=r$, and the given space $FD^2+FE^2=m^2$. From similar triangles $z:x::b:r$, and $z=\frac{bx}{r}$. Also $b-z:y::b:p$, and $z=b-\frac{yb}{p}$; therefore $\frac{bx}{r}=b-\frac{yb}{p}$. That is $y=p-\frac{px}{r}$, an equation to a straight line.



But $x^2+y^2=m^2$ of which the locus is a circle, having m for the radius. By constructing these loci, their intersection will give a solution of the problem.

Let $KL=CG$ $(=r)$ be at right angles to $LM=BH$ $(=p)$, join KM to which let LN be parallel; LN is the locus of the equation $y=p-\frac{px}{r}$; for let any line OPQ be drawn parallel to LM, if $KP=x$, then $PQ=\frac{px}{r}$, and $QO=LM=p$, therefore $PO=y=p-\frac{px}{r}$.



About the centre K, with a distance equal to the line m, let a circle be described; that circle will be the locus of the equation $m^2=x^2+y^2$; for it is plain that if OP be any perpendicular from the circumference upon KL, KP being x, OP will be y. Either of the points, therefore, in which these two loci intersect each other, as O, will give OP an ordinate in both equations, KP being the common absciss; therefore KP, OP are the two perpendiculars required, from which the point F is easily found.

The construction might have been made on figure 1st, with fewer lines. If the circle touches LN, there is only one solution which is a minimum; and if the circle does not meet LN, the problem becomes impossible.

When the circle touches LN, the radius m must be equal to the perpendicular from K on LN, or from L on KM. This perpendicular is equal to $\frac{pr}{\sqrt{p^2+r^2}}$ or a fourth proportional to MK, KL, and LM, and its square therefore is the least sum of the squares of the perpendiculars from a point in the base on the two sides.

It may be remarked also, that the point which gives the sum of the squares a minimum, is found by dividing the base, in the proportion of the squares of the two sides of the triangle; and this is easily demonstrated from the preceding construction.

PROB. V. *Between two given Lines to find two mean Proportionals.*

Let the lines be a and b, and let the two means be x and y; therefore $a:x:y:b$, and hence $ay=x^2$, and $bx=y^2$, which are both equations to the parabola, and are easily constructed. The co-ordinates at the intersection of these two loci will be the means required.

If one unknown quantity only is assumed, or if it is convenient to deduce a final equation containing only one, the construction of the roots is to be obtained by the method mentioned in the next section.

Scholium.

The constructions of the two preceding problems are geometrical; but it is sometimes convenient to have a practical solution, by the mechanical description either of the algebraical lines employed in the geometrical solution, or of other geometrical lines by which it can be effected. But few of these are tolerably accurate; so that, in general, by means of calculation, the practical operations are all reduced to what may be performed by a ruler and a compass.

III. *Construction of Equations.*

The roots of an equation, containing only one unknown quantity, may be found by the intersection of lines, the product of whose dimensions is equal to the dimension of that equation. And hence problems are resolved without an algebraical solution of the equation arising from them.

Thus cubic and biquadratic equations may be constructed by the intersections of two conic sections as the circle and parabola, which are generally assumed as being most easily described.

In order to find these constructions, a new equation is to be assumed, containing two variable quantities, one of which is the unknown quantity of the given equation, and the other by substitution is to be inserted also in the given equation; the intersection of the loci of these equations will exhibit the roots required.

Canons may be devised for the construction of particular orders, without assuming the new equation.

The final equation from prob. 5. would be $x^3=a^2b$, which being constructed according to the rules, exhibits the common geometrical solution of that problem by the circle and parabola.

If an equation be assumed, as $ay=x^2$, the other by substitution becomes $xy=ab$; the locus of the former is a parabola, and of the latter an hyperbola, one of its assymptotes being the base, and the co-ordinates at their intersection will represent x and y; the first of the two means is x, and in this case y is the other.

Application to Geometry.

Equations also might be assumed so as to give a solution of this problem by other combinations of two of the conic sections, one of them not being the circle.

As geometrical magnitudes may be represented by algebra, so algebraical quantities and numbers may be represented by lines. Hence this construction of equations has sometimes been used as an easy method of approximation to the roots of numeral equations. For this purpose, the necessary straight lines must be laid down by means of a scale of equal parts, and the curve lines, on whose intersection the construction depends, must be actually described; the linear roots being measured on the scale will give the numbers required. These operations may be performed with sufficient accuracy for certain purposes; but as they depend on mechanical principles, the approximation obtained by them cannot be continued at pleasure; and hence it is seldom used, except in finding the first step of an approximation, which is to be carried on by other methods.

Scholium.

If the relation between the ordinate and abscis be fixed, but not expressible by a finite equation, the curve is called *Mechanical* (A) or *Transcendental*. This class is also sometimes defined by equations, by supposing either x or y in a finite equation to be a curve line, of which the relation to a straight line cannot be expressed in finite terms.

If the variable quantities x or y enter the exponents of any term of an equation, the locus of that equation is called an *Exponential Curve*.

Many properties of these two classes of curves may be discovered from their equations.

A L G

Algedo | Algiabarii.

ALGEDO, the running of a gonorrhœa stopping suddenly after it appears. When it thus stops, a pain reaches to the anus, or to the testicles, without their being swelled; and sometimes this pain reaches to the bladder; in which case there is an urging to discharge the urine, which is with difficulty passed, and in very small quantities at a time. The pain is continued to the bladder by the urethra; to the anus, by the acceleratory muscles of the penis; and to the testicles, by the vasa deferentia, and vesiculæ seminales. In this case, calomel repeated so as to purge, brings back the running, and then all difficulty from this symptom ceases.

ALGENEB, a fixed star, of the second magnitude, in Perseus's right side; its longitude is 27° 46′ 12″ of Taurus, and its latitude 30° 05′ 28″ north, according to Mr Flamstead's catalogue.

ALGEZIRA, a town of Andalusia in Spain, with a port on the coast of the Straits of Gibraltar. By this city the Moors entered Spain in 713; and it was taken from them in 1344, after a very long siege, remarkable for being the first in which cannon were made use of. It was called *Old Gibraltar*, and is about four leagues from the New. W. Long. 5. 2. N. Lat. 36. 0.

ALGHIER, or ALGERI, a town in Sardinia, with a bishop's see, upon the western coast of the island, between Sasseri and Bosa. Though it is not large, it is well peopled, and has a commodious port. The coral fished for on this coast is in the highest esteem of any in the Mediterranean. W. Long. 4. 2. Lat 36. 0.

ALGIABARII, a Mahometan sect of predestinarians, who attribute all the actions of men, good or evil, to the agency or influence of God. The Algiabarii stand opposed to the ALKADARII. They hold absolute degrees and physical premotion. For the justice of God in punishing the evil he has caused, they resolve it wholly into his absolute dominion over the creatures.

A L G

Algiers.

ALGIERS, a kingdom of Africa, now one of the states of Barbary.—According to the latest and best computations, it extends 460 miles in length from east to west, and is very unequal in breadth; some places being scarce 40 miles broad, and others upward of 100. It lies between Long. 1. 0. and 9. 37. W. and extends from Lat. 0. 0. to 36. 50. N.—It is bounded on the north, by the Mediterranean; on the east by the river Zaine, the ancient Tusca, which divides it from Tunis; on the west, by the Mulvya, and the mountains of Trava, which separate it from Morocco; and on the south by the Sahara, Zaara, or Numidian desert.

1 Climate and soil.

The climate of Algiers is in most places so moderate, that they enjoy a constant verdure; the leaves of the trees being neither parched up by heat in summer, nor nipped by the winter's cold. They begin to bud in February; in April the fruit appears in its full bigness, and is commonly ripe in May. The soil, however, is excessively various; some places being very hot, dry, and barren, on which account they are generally suffered to lie uncultivated by the inhabitants, who are very negligent. These barren places, especially such as lie on the southern side, and are at a great distance from the sea, harbour vast numbers of wild creatures, as lions, tigers, buffaloes, wild boars, stags, porcupines, monkeys, ostriches, &c. On account of their barrenness, they have but few towns, and those thinly peopled; though some of them are so advantageously situted for trading with Bildulgerid and Negroland, as to drive a considerable traffic with them.

The Algerine kingdom made formerly a considerable part of the Mauritania Tingitana (See MAURITANIA), which was reduced to a Roman province by Julius Cæsar, and from him also called *Mauritania Cæsariensis*.—In the general account of Africa, it has been noticed, that the Romans were driven out of that continent by the Vandals; these by Belisarius, the Greek emperor Justinian's general; and the Greeks in their turn by the Saracens. This last revolution happened

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(A) The term *Mechanical*, in this place, is used merely as the name of a particular class of curves, without implying that they have any more dependence on the principles of Mechanics or Physics than the algebraical curves which have been treated of.

Algiers. happened about the middle of the seventh century; and the Arabs continued masters of the country, divided into a great number of petty kingdoms or states, under chiefs of their own choosing, till the year 1051.

2 Abu Texefien subdues the Arab princes.

This year, one Abubeker-ben-Omar, or, as the Spanish authors call him, *Abu Texefian*, an Arab of the Zinhagian tribe, being provoked at the tyranny of those despots, gathered, by the help of his marabouts or saints, a most powerful army of malcontents, in the southern provinces of Numidia and Libya. His followers were nicknamed *Marabites* or *Morabites;* by the Spaniards, *Almoravides*; probably from their being assembled principally by the saints who were also called *Morabites*. The khalif of Kayem's forces were at this time taken up with quelling other revolts in Syria, Mesopotamia, &c. and the Arabs in Spain engaged in the most bloody wars; so that Texefien having nothing to fear from them, had all the success he could wish against the Arabian cheyks or petty tyrants, whom he defeated in many battles, and at last drove them not only out of Numidia and Libya, but out of all the western parts, reducing the whole province of Tingitania under his dominion.

Texefien was succeeded by his son Yusef, or Joseph, a brave and warlike prince. In the beginning of his reign, he laid the foundation of the city of Morocco, which he designed to make the capital of his empire. While that city was building, he sent some of his marabouts ambassadors to Tremecen (now a province of Algiers), at that time inhabited by a powerful and insolent sect of Mahometans called *Zeneti*. The design of this embassy was to bring them back to what he called the *true faith*; but the Zeneti, despising his offers, assembled at Amaf, or Amfa, their, capital, murdered the ambassadors, and invaded Joseph's dominions with an army of 50,000 men.

3 Zeneti destroyed.

The king hearing of their infamous proceedings, speedily mustered his army, and led it by long marches into their country, destroying all with fire and sword; while the Zeneti, instead of opposing his progress, retired as fast as possible towards Fez, in hopes of receiving assistance from thence. In this they were miserably deceived: the Fezzans marched out against them in a hostile manner; and coming up with the unhappy Zeneti, encumbered with their families and baggage, and ready to expire with hunger and weariness they cut them all to pieces, except a small number who were mostly drowned in attempting to swim across a river, and some others who in their flight perished by falling from the high adjacent rocks. In the mean time Joseph reduced their country to a mere desart: which was, however, soon peopled by a numerous colony of Fezzans, who settled there under the protection of the reigning kings. In this war it is computed that near a million of the Zeneti, men, women, and children, lost their lives.

The restless and ambitions temper of Joseph did not let him remain long at peace. He quickly declared war against the Fezzans, reduced them to become his tributaries, and extended his conquests all along the Mediterranean. He next attacked some Arabian cheyks who had not yet submitted to his jurisdiction; and pursued them with such fury, that neither the Libyan desarts, nor ridges of the most craggy rocks, could shelter them from his arms. He attacked them in such of their retreats, castles, and fortresses, as were till then deemed impregnable: and at last subdued them, to the great grief of the other African nations, who were greatly annoyed by the ravages committed by his numerous forces.

Thus was founded the empire of the Morabites: which, however, was of no long duration; that race being in the 12th century driven out by Mohavedin, a marabout. This race of priests was expelled by Abdulac governor of Fez; and he, in the 13th century, stripped of his new conquests by the Sharifs of *Hascen*, the descendants of those Arabian princes whom Abu-Texefien had formerly expelled.

4 Sharifs of Hascen who.

The better to secure their new dominions, the Sharifs divided them into several little kingdoms or provinces; and among the rest the present kingdom of Algiers was divided into four, namely, *Tremecen, Tenez, Algiers proper*, and *Bujeyah*. The four first monarchs laid so good a foundation for a lasting balance of power between their little kingdoms, that they continued for some centuries in mutual peace and amity; but at length the king of Tremecen having ventured to violate some of their articles, Abul-Farez, king of Tenez, declared war against him, and obliged him to become his tributary. This king dying soon after, and having divided his kingdom among his three sons, new discords arose; which Spain taking advantage of, a powerful fleet and army was sent against Barbary, under the Count of Navarre, in 1505. This commander soon made himself master of the important cities of Oran, Bujeyah, and some others; which so alarmed the Algerines, that they put themselves under the protection of Selim Eutemi, a noble and warlike Arabian prince. He came to their assistance with a great number of his bravest subjects, bringing with him his wife Zaphira, and a son then about 12 years old. This however was not sufficient to prevent the Spaniards from landing a number of forces near Algiers that same year, and obliging that metropolis to become tributary to Spain. Nor could Prince Selim hinder them from building a strong fort on a small island opposite to the city, which terrified their corsairs from sailing either in or out of the harbour.

5 Algerines in danger from the Spaniards.

To this galling yoke the Algerines were obliged to submit till the year 1516; when, hearing of the death of Ferdinand king of Spain, they sent an embassy to *Aruch Barbarossa*, who was at this time no less dreaded for his valour than his surprising success, and was then sent on a cruize with a squadron of galleys and barks. The purport of the embassy was, that he should come and free them from the Spanish yoke; for which they agreed to pay him a gratuity answerable to so great a service. Upon this Barbarossa immediately dispatched 18 galleys and 30 barks to the assistance of the Algerines; while he himself advanced towards the city with 800 Turks, 3000 Jigelites, and 2000 Moorish volunteers. Instead of taking the nearest road to Algiers, he directed his course towords *Sharshel*, where *Hassen*, another famed corsair, had settled himself. Him he surprised, and obliged to surrender; not without a previous promise of friendship: but no sooner had Barbarossa got him in his power, than the cut off his head; and obliged all Hassan's Turks to follow him in his new expedition.

6 Invite Barbarossa.

On Barbarossa's approach to Algiers, he was met by

Algiers.

7 His treachery and cruelty.

prince Eutemi, attended by all the people of that metropolis, great and small; who looked for deliverance from this abandoned villain, whom they accounted invincible. He was conducted into the city amidst the acclamations of the people, and lodged in one of the noblest apartments of prince Eutemi's place, where he was treated with the greatest marks of distinction. Elated beyond measure with this kind reception, Barbarossa formed a design of becoming king of Algiers; and fearing some opposition from the inhabitants, on account of the excesses he suffered his soldiers to commit, murdered prince Eutemi, and caused himself to be proclaimed king; his Turks and Moors crying out as he rode along the streets, "Long live King Aruch Barbarossa, the invincible king of Algiers, the *chosen of God* to deliver the people from the oppression of the Christians; and destruction to all that shall oppose, or refuse to own him as their lawful sovereign." These last threatening words so intimidated the inhabitants, already apprehensive of a general massacre, that he was immediately acknowledged king. The unhappy princess Zaphira, it is said, poisoned herself, to avoid the brutality of this new king, whom she unsuccessfully indeavoured to stab with a dagger.

Barbarossa was no sooner seated on the throne, than he treated his subjects with such cruelty, that they used to shut up their houses and hide themselves when he appeared in public. In consequence of this, a plot was soon formed against him; but being discovered, he caused twenty of the principal conspirators to be beheaded, their bodies to be buried in a dunghill, and laid a heavy fine on those who survived. This so terrified the Algerines, that they never afterwards durst attempt any thing against either Barbarossa or his successors.

In the mean time, the son of prince Eutemi having fled to Oran, and put himself under the protection of the marquis of Gomarez, laid before that nobleman a plan for putting the city of Algiers into the hands of the king of Spain. Upon this, young Selim Eutemi was sent to Spain, to lay his plan before cardinal Ximenes; who having approved of it, sent a fleet with 10,000 land forces, under the command of *Don Francisco*, or, as others called him, *Don Diego de Vera*, to drive out the Turks, and restore the young prince. But the fleet was no sooner come within sight of land, than it was dispersed by a storm, and the greatest part of the ships dashed against the rocks. Most of the Spaniards were drowned; and the few who escaped to shore were either killed by the Turks or made slaves.

Though Barbarossa had nothing to boast on this occasion, his pride and insolence were now swelled to such a degree, that he imagined himself invincible, and that the very elements conspired to make him so. The Arabians were so much alarmed at his success, that they implored the assistance of Hamidel Abdes king of Tenez, to drive the Turks out of Algiers. That prince readily undertook to do what was in his power for this purpose, provided they agreed to settle the kingdom on himself and his descendants. This proposal being accepted, he immediately set out at the head of 10,000 Moors; and, upon his entering the Algerine dominions, was joined by all the Arabians in the country. Barbarossa engaged him, only with 1000 Turkish musqueteers and 500 Granada Moors; totally defeated his numerous army; pursued him to the very gates of his capital, which he easily made himself master of; and, having given it up to be plundered by his Turks, obliged the inhabitants to acknowledge him as their sovereign. This victory, however, was chiefly owing to the advantage which his troops had from their fire-arms; the enemy having no other weapons than arrows and javelins.

No sooner was Barbarossa become master of the kingdom of Tenez, than he received an embassy from the inhabitants of Tremecen; inviting him to come to their assistance against their then reigning prince, with whom they were dissatisfied on account of his having dethroned his nephew, and forced him to fly to Oran: offering him even the sovereignty, in case he accepted of their proposal. The king of Tremecen, not suspecting the treachery of his subjects, met the tyrant with an army of 6000 horse and 3000 foot: but Barbarossa's artillery gave him such an advantage, that the king was at length forced to retire into the capital; which he had no sooner entered than his head was cut off, and sent to Barbarossa, with a fresh invitation to come and take possession of the kingdom. On his approach, he was met by the inhabitants, whom he received with great complaisance, and many fair promises; but beginning to tyrannize as usual, his new subjects soon convinced him that they were not so passive as the inhabitants of Algiers. Apprehending, therefore, that his reign might prove uneasy and precarious, he entered into an alliance with the king of Fez; after which, he took care to secure the rest of the cities in his new kingdom by garrisoning them with his own troops. Some of these, however, revolted soon after; upon which he sent one of his corsairs, named *Escander*, a man no less cruel than himself, to reduce them. The Tremecenians now began to repent in good earnest of their having invited such a tyrant to their assistance; and held consultations on the most proper means of driving him away, and bringing back their lawful prince *Abuchen Men*; but their cabals being discovered, a great number of the conspirators were massacred in the most cruel manner. The prince had the good luck to escape to Oran, and was taken under the protection of the marquis of Gomarez, who sent immediate advice of it to Charles V. then lately arrived in Spain, with a powerful fleet and army. That monarch immediately ordered the young king a succour of 10,000 men, under the command of the governor of Oran; who, under the guidance of Abuchen Men, began his march towards Tremecen; and in their way they were joined by prince Selim, with a great number of Arabs and Moors. The first thing they resolved upon was, to attack the important fortress of *Calau*, situated between Tremecen and Algiers, and commanded by the corsair Escander at the head of about 300 Turks. They invested it closely on all sides, in hopes Barbarossa would come out of Tremecen to its relief, which would give the Tremecenians an opportunity of keeping him out. That tyrant, however, kept close in his capital, being embarrassed by his fears of a revolt, and the politic delays of the king of Fez, who had not sent the auxiliaries he promised. The garrison of Calau, in the mean time, made a brave defence; and, in a sally they made at night, cut off near 300 Spaniards. This encouraged them to venture a second time; but they were now repulsed with great loss, and Escander himself wounded: soon

Algiers. ſoon after which, they ſurrendered upon honourable terms; but were all maſſacred by the Arabians, except 16, who clung cloſe to the ſtirrups of the king, and of the Spaniſh general.

Barbaroſſa being now informed that Abuchen Men, with his Arabs, accompanied by the Spaniards, were in full march to lay ſiege to Tremecen, thought proper to come out, at the head of 1500 Turks and 5000 Mooriſh horſe, in order to break his way through the enemy; but he had not proceeded far from the city, before his council adviſed him to return and fortify himſelf in it. This advice was now too late; the inhabitants being reſolved to keep him out, and open their gates to their own lawful prince as ſoon as he appeared. In this diſtreſs Barbaroſſa ſaw no way left but to retire to the citadel, and there defend himſelf till he could find an opportunity of ſtealing out with his men and all his treaſure. Here he defended himſelf vigorouſly; but his proviſions failing him, he took advantage of a ſubtarraneous back-way, which he had cauſed to be digged up for that purpoſe, and, taking his immenſe treaſure with him, ſtole away as ſecretly as he could. His flight, however, was ſoon diſcovered: and he was ſo cloſely purſued, that to amuſe, as he hoped, the enemy, he cauſed a great deal of his money, plate, jewles, &c. to be ſcattered all the way, thinking they would not fail to ſtop their purſuit to gether it up. This ſtratagem, however, failed, through the vigilance of the Spaniſh commander, who being himſelf at the head of the purſuers, obliged them to march on, till he was come up cloſe to him on the banks of the *Huexda*, about eight leagues from Tremecen. Barbaroſſa had juſt croſſed the river with his vanguard, when the Spaniards came up with his rear on the other ſide, and cut them all off; and then croſſing the water, overtook him at a ſmall diſtance from it. Here a bloody engagement enſued, in which the Turks fought like as many lions;

8 Barbaroſſa defeated and killed by the Spaniards.

but, being at length overpowered by numbers, they were all cut to pieces, and Barbaroſſa among the reſt, in the 44th year of his age, and four years after he had raiſed himſelf to the royal title of *Jigel* of the adjacent country; two years after he had acquired the ſovereignty of Algiers, and ſcarce a twelvemonth after the reduction of Tremecen. His head was carried to Tremecen, on the point of a ſpear; and Abuchen Men proclaimed king, to the joy of all the inhabitants. A few days after the fight, the king of Fez made his appearance at the head of 20,000 horſe, near the field of battle; but hearing of Barbaroſſa's defeat and death, marched off with all poſſible ſpeed, to avoid being attacked by the enemy.

9 Succeeded by Hayradin.

The news of Barbaroſſa's death ſpread the utmoſt conſternation among the Turks at Algiers; however, they cauſed his brother Hayradin to be immediately proclaimed king. The Spaniſh commander now ſent back the emperor's forces, without making any attempt upon Algiers; by which he loſt the opportunity of driving the Turks out of that country; while Hayradin, juſtly dreading the conſequences of the tyranny of his officers, ſought the protection of the Grand Signior. This was readily granted, and himſelf appointed baſhaw or viceroy of Algiers; by which means he received ſuch conſiderable reinforcements, that the unhappy Algerines durſt not make the leaſt complaint; and ſuch numbers of Turks reſorted to him, that he was not only capable of keeping the Moors and Arabs in ſubjection at home, but of annoying the Chriſtians at ſea. His firſt ſtep was to take the Spaniſh fort abovementioned, which was a great nuiſance to his metropolis. The Spaniards held out to the laſt extremity; but being all ſlain or wounded, Hayradin eaſily became maſter of the place.

10 He takes the Spaniſh fort.

Hayradin next ſet about building a ſtrong mole for the ſafety of his ſhips. In this he employed 30,000 Chriſtian ſlaves, whom he obliged to work without intermiſſion for three years; in which time the work was completed. He then cauſed the fort he had taken from the Spaniards to be repaired, and placed a ſtrong garriſon in it, to prevent any foreign veſſels from entering the harbour without giving an account of themſelves. By theſe two important works, Hayradin ſoon became dreaded not only by the Arabs and Moors, but alſo by the maritime Chriſtian powers, eſpecially the Spaniards. The viceroy failed not to acquaint the Grand Signior with his ſucceſs, and obtained from him a freſh ſupply of money, by which he was enabled to build a ſtronger fort, and to erect batteries on all places that might favour the landing of an enemy. All theſe have ſince received greater improvements from time to time, as often as there was occaſion for them.

11 Succeeded by Haſſan Aga.

In the mean time the Sultan, either out of a ſenſe of the great ſervices Hayradin had done, or perhaps out of jealouſy leſt he ſhould make himſelf independent, raiſed Hayradin to the dignity of baſhaw of the empire, and appointed Haſſan Aga, a Sardinian renegado, an intrepid warrior, and an experienced officer, to ſucceed him as baſhaw of Algiers. Haſſan had no ſooner taken poſſeſſion of his new government, than he began to purſue his ravages on the Spaniſh coaſt with greater fury than ever; extending them to the eccleſiaſtical ſtate, and other parts of Italy. But Pope Paul III. being alarmed at this, exorted the emperor Charles V. to ſend a powerful fleet to ſuppreſs thoſe frequent and cruel piracies; and, that nothing might be wanting to render the interpriſe ſucceſsful, a bull was publiſhed by his holineſs, wherein a plenary abſolution of ſins, and the crown of martyrdom, was promiſed to all thoſe who either fell in battle or were made ſlaves; the emperor on his part needed no ſpur;

12 Charles Vth's expedition againſt Algiers.

and therefore ſet ſail at the head of a powerful fleet conſiſting of 120 ſhips and 20 gallies, having on board 30,000 choſen troops, an immenſe quantity of money, arms, ammunition, &c. In this expedition many young nobility and gentry attended as volunteers, and among theſe many knights of Malta, ſo remarkable for their valour againſt the enemies of Chriſtianity. Even ladies of birth and character attended Charles in his expedition, and the wives and daughters of the officers and ſoldiers followed them with a deſign to ſettle in Barbary after the conqueſt was finiſhed. All theſe meeting with a favourable wind, ſoon appeared before Algiers; every ſhip diſplaying the Spaniſh colours on the ſtern, and another at the head, with a crucifix to ſerve them for a pilot.

13 Algiers in great conſternation.

By this prodigious armament, the Algerines were thrown into the utmoſt conſternation. The city was ſurrounded only by a wall with ſcarce any outworks. The whole garriſon conſiſted of 800 Turks and 6000 Moors without fire-arms, and poorly diſciplined and accoutred; the reſt of their forces being diſperſed in the

Algiers.

the other provinces of the kingdom, to levy the usual tribute on the Arabs and Moors. The Spaniards landed without opposition, and immediately built a fort, under the cannon of which they encamped, and diverted the course of a spring which supplied the city with water. Being now reduced to the utmost distress, Hassan received a summons to surrender at discretion, on pain of being put to the sword with all the garrison. The herald was ordered to extol the vast power of the emperor both by sea and land, and to exhort him to return to the Christian religion. But to this Hassan only replied, that he must be a madman who would pretend to advise an enemy, and that the advised must still act more madly who would take counsel of such an adviser. He was, however, on the point of surrendering the city, when advice was brought him that the forces belonging to the western government were in full march towards the place; upon which it was resolved to defend it to the utmost. Charles, in the mean time, resolving upon a general assault, kept a constant firing upon the town; which, from the weak defence

14 Prevented by a mad prophet from surrendering.

made by the garrison, he looked upon as already in his hands. But while the *douwan*, or Algerine senate, were deliberating on the most proper means of obtaining an honorable capitulation, a mad prophet, attended by a multitude of people, entered the assembly, and foretold the speedy destruction of the Spaniards before the end of the moon, exorting the inhabitants to hold out till that time. This prediction was soon accomplished in a very surprising and unexpected manner: for, on the 28th of October 1541, a dreadful storm of wind rain, and hail, arose from the north, accompanied with violent shocks of earthquakes, and a dismal and universal darkness both by sea and land; so that the sun,

15 Spanish fleet destroyed by a storm.

moon, and elements, seemed to combine together for the destruction of the Spaniards. In that one night, some say in less than half an hour, 86 ships and 15 galleys, were destroyed, with all their crews and military stores; by which the army on shore were deprived of all means of subsisting in these parts. Their camp also, which spread itself along the plain under the fort, was laid quite under water by the torrents which descended from the neighbouring hills. Many of the troops, by trying to remove into some better situation, were cut in pieces by the Moors and Arabs; while several galleys, and other vessels, endeavouring to gain some neighbouring creeks along the coasts, were immediately plundered, and their crews massacred by the inhabitants.

The next morning Charles beheld the sea covered with the fragments of so many ships, and the bodies of men, horses, and other creatures, swimming on the waves; at which he was so disheartned, that abandon-

16 Siege of Algiers raised.

ing his tents, artillery, and all his heavy baggage, to the enemy, he marched at the head of his army, though in no small disorder, towards cape *Malabux*, in order to reimbark in those few vessels which had outweathered the storm. But Hassan, who had caused his motions to be watched, allowed him just time to get to the shore, when he sallied out and attacked the Spaniards in the midst of their hurry and confusion to get into their ships, killing great numbers, and bringing away a still greater number of captives; after which he returned in triumph to Algiers, where he celebrated with great rejoicings his happy deliverance from such distress and danger.

Soon after this, the prophet *Yusef*, who had foretold the destruction of the Spaniards, was not only declared the deliverer of his country, but had a considerable gratuity decreed him, with the liberty of exercising his prophetic function unmolested. It was not long, however, before the marabouts, and some interpreters of the law, made a strong opposition against him; remonstrating to the bashaw, how ridiculous and scandalous it was to their nation, to ascribe the deliverance of it to a poor fortune-teller, which had been obtained by the fervent prayers of an eminent saint of their own profession. But though the bashaw and his douwan seemed, out of policy, to give into his last notion, yet the impression which Yusef's predictions and their late accomplishments had made upon the minds of the common people, proved too strong to be eradicated; and the spirit of divination and conjuring has since got into such credit among them, that not only their great statesmen, but their priests, marabouts, and santoons, have applied themselves to that study, and dignified it with the name *Mahomet's Revelations*. 17 The mad prophet rewarded.

18 Fresh calamities of the Spaniards.

The unhappy Spaniards had scarce reached their ships, when they were attacked by a fresh storm, in which several more of them perished; one ship in particular, containing 700 soldiers, besides sailors, sunk in the emperor's sight, without a possibility of saving a single man. At length, with much labour, they reached the port of *Bujeyah*, at that time possessed by the Spaniards, whither Hassan king of Tunis soon after repaired, with a supply of provisions for the emperor, who received him graciously, with fresh assurances of his favour and protection. Here he dismissed the few remains of the Maltese knights and their forces, who embarked in three shattered galleys, and with much difficulty and danger reached their own country. Charles himself staid no longer than till the 16th of November, when he set sail for Carthagena, and reached it on the 25th of the same month. In this unfortunate expedition upwards of 120 ships and galleys were lost, above 300 colonels and other land and sea officers, 8000 soldiers and marines, besides those destroyed by the enemy on the reimbarkation, or drowned in the last storm. The number of prisoners was so great, that the Algerines sold some of them, by way of contempt, for an onion per head.

12 Hassan reduces Tremecen.

Hassan, elated with this victory, in which he had very little share, undertook an expedition against the king of Tremecen, who, being now deprived of the assistance of the Spaniards, was forced to procure a peace by paying a vast sum of money, and becoming tributary to him. The bashaw returned to Algiers, laden with riches; and soon after died of a fever, in the 66th year of his age.

20 Bujeyah taken from the Spaniards.

From this time the Spaniards were never able to annoy the Algerines in any considerable degree. In 1555, they lost the city of Bujeyah, which was taken by *Salha Rais*, Hassan's successor; who next year set out on a new expedition, which he kept a secret, but was suspected to be intended against Oran: but he was scarcely got four leagues from Algiers, when the plague which at that time raged violently in the city, broke out in his groin, and carried him off in 24 hours.

21 Hassan Corso chosen bashaw by the Janisaries.

Immediately after his death the Algerine soldiery chose a Corsican renegado, Hassan Corso, in his room, till they should receive further orders from the Porte. He

Algiers.

He did not accept of the baſhawſhip without a good deal of difficulty; but immediately proſecuted the intended expedition againſt Oran, diſpatching a meſſenger to acquaint the Porte with what had happened. They had hardly begun their hoſtilities againſt the place, when orders came from the Porte, expreſsly forbidding Haſſan Corſo to begin the ſiege, or, if he had begun it, enjoining him to raiſe it immediately. This news was received with great grief by the whole fleet and army, as they thought themſelves ſure of ſucceſs, the garriſon being at that time very weak. Nevertheleſs, as they

22 dared not diſobey, the ſiege was immediately raiſed.

Superſeded by Tekelli, who puts him to a crueldeath.

Corſo had hardly enjoyed his dignity four months, before news came, that eight galleys were bringing a new baſhaw to ſucceed him; one *Tekelli*, a principal Turk of the Grand Signior's court: upon which the Algerines unanimouſly reſolved not to admit him. By the treachery of the Levantine ſoldiers, however, he was admitted at laſt, and the unfortunate Corſo thrown over a wall in which a number of iron hooks were fixed; one of which catching the ribs of his right ſide, he hung three days in the moſt exquiſite torture before he expired.

Tekelli was no ſooner entered upon his new government, than he behaved with ſuch cruelty and rapacioufneſs, that he was aſſaſſinated even under the dome of a ſaint, by Yuſef Calabres, the favourite renegado of Haſſan Corſo; who for this ſervice was unanimouſly choſen baſhaw, but died of the plague ſix days after his election.

23

Haſſan reinſtated.

Yuſef was ſucceeded by Haſſan the ſon of Hayradin, who had been formerly recalled from his baſhawſhip, when he was ſucceeded by Selha-Rais; and now had the good fortune to get himſelf reinſtated in his employment. Immediately on his arrival, he engaged in a war with the Arabs, by whom he was defeated

24

Spaniards defeated with great ſlaughter.

with great loſs. The next year, the Spaniards undertook an expedition againſt Moſtagan, under the command of the count d'Alcandela; but were utterly defeated, the commander himſelf killed, and 12,000 taken priſoners. This diſaſter was owing to the inconſiderate raſhneſs, or rather madneſs, of the commander; which was ſo great, that, after finding it impoſſible to rally his ſcattered forces, he ruſhed, ſword in hand, into the thickeſt of the enemy's ranks, at the head of a ſmall number of men, crying out, "St Jago! St Jago! the victory is ours, the enemy is defeated;" ſoon after which he was thrown from his horſe, and trampled to death.

Haſſan having had the misfortune to diſoblige his ſubjects by allowing the mountaineers of Cuco to buy ammunition at Algiers, was ſent in irons to Conſtan-

25

Haſſan ſent in irons to Conſtantinople.

tinople, while the aga of the Janiſaries, and general of the land forces, ſupplied his place.—Haſſan eaſily found means to clear himſelf; but a new baſhaw was appointed, called Achmet; who was no ſooner arrived, than he ſent the two deputy-baſhaws to Conſtantinople, where their heads were ſtruck off.—Achmet was a man of ſuch inſatiable avarice, that, upon his arrival at Algiers, all ranks of people came in ſhoals to make him preſents; which he the more greedily accepted, as he had bought his dignity by the money he had amaſſed while head gardener to the Sultan. He enjoyed it, however, only four months; and after his death, the ſtate was governed other four months by his lieutenant;

when Haſſan was a third time ſent viceroy to Algiers, where he was received with the greateſt demonſtrations of joy.

Algiers.

26

Reinſtated.

27

Siege of Marſalquiver.

The firſt enterpriſe in which Haſſan engaged, was the ſiege of Marſalquiver, ſituated near the city Oran, which he deſigned to inveſt immediately after. The army employed in this ſiege conſiſted of 26,000 foot and 10,000 horſe, beſides which he had a fleet conſiſting of 32 galleys and galliots, together with three French veſſels laden with biſcuit, oil, and other proviſions. The city was defended by Don Martin de Cordova, brother of the Count d'Alcandela, who had been taken priſoner in the battle where that nobleman was killed, but had obtained his liberty from the Algerines with immenſe ſums, and now made a moſt gallant defence againſt the Turks. The city was attacked with the utmoſt fury by ſea and land, ſo that ſeveral breaches were made in the walls. The Turkiſh ſtandards were ſeveral times planted on the walls, and as often diſlodged; but the place muſt have in the end ſubmitted, had not Haſſan been obliged to raiſe the ſiege in haſte, on the news that the famed Genoeſe admiral Doria was approaching with conſiderable ſuccours from Italy. The fleet accordingly arrived ſoon after; but miſſing the Algerine gallies, bore away for Pennon de Velez, where they were ſhamefully repulſed by an handful of Turks who garriſoned that place; which, however, was taken the following year.

28

Haſſan again recalled.

In 1567, Haſſan was again recalled to Conſtantinople, where he died three years after. He was ſucceeded by Mahomet, who gained the love of the Algerines by ſeveral public-ſpirited actions. He incorporated the Janiſaries and Levantine Turks together, and by that means put an end to their diſſenſions, which laid the foundation of the Algerine independency on the Porte. He likewiſe added ſome conſiderable fortifications to the city and caſtle, which he deſigned to

29

John Gaſcon's bold attempt to fire the Algerine fleet.

render impregnable. But while he was thus ſtudying the intereſt of Algiers, one John Gaſcon, a bold Spaniſh adventurer, formed a deſign of ſurpriſing the whole piratic navy in the bay, and ſetting them on fire in the night-time, when they lay defenceleſs, and in their firſt ſleep. For this he had not only the permiſſion of king Philip II. but was furniſhed by him with proper veſſels, mariners, and fireworks, for the execution of his plot. With theſe he ſet ſail for Algiers in the moſt proper ſeaſon, *viz.* the beginning of October, when moſt, if not all the ſhips lay at anchor there; and eaſily ſailed near enough, unſuſpected, to view their manner of riding, in order to catch them napping, at a time when the greater part of their crew were diſperſed in their quarters. He came accordingly, unperceived by any, to the very mole-gate, and diſperſed his men with their fire-works; but to their great ſurpriſe, they found them ſo ill mixed, that they could not with all

30

His bravado at the city gate.

their art make them take fire. In the mean time, Gaſcon took it into his head, by way of bravado, to go to the mole-gate, and give three loud knocks at it with the pommel of his dagger, and to leave it fixed in the gate by its point, that the Algerines might have cauſe to remember him. This he had the good fortune to do without meeting with any diſturbance or oppoſition: but it was not ſo with his men; for no ſooner did they find their endeavours unſucceſsful, than they made ſuch a buſtle as quickly alarmed the guard poſted on the adjacent

jacent bastion, from which the uproar quickly spread itself thro' the whole garrison. Gascon, now finding himself in the utmost danger, sailed away with all possible haste: but he was pursued, overtaken, and brought back a prisoner to Mahomet; who no sooner got him into his power, than he immediately caused a gibbet of considerable height to be erected on the spot where Gascon had landed, ordering him to be hoisted up, and hung by the feet to a hook, that he might die in exquisite torture; and to show his resentment and contempt of the king his master, he ordered his commission to be tied to his toes. He had not, however, hung long in that state, when the captain who took him, accompanied by a number of other corsairs, interceded so strongly in his behalf, that he was taken down, and put under the care of some Christian surgeons; but two days after, some Moors reporting that it was the common talk and belief in Spain, that the Algerines durst not hurt a hair of Gascon's head, *&c.* the unfortunate Spaniard was hoisted up by a pulley to the top of the execution-wall, and let down again upon the hook, which in his fall catched him by the belly, and gave him such a wound, that he expired without a groan.——Thus ended the expedition of John Gascon, which has procured him a place among the Spanish martyrs; while, on the other hand, the Algerines look upon his disappointment to have been miraculous, and owing to the efficacious protection of the powerful saint *Sidi Outededda*, whose prayers had before raised such a terrible storm against the Spanish fleet.

31 Is taken and put to death.

Mahomet, being soon after recalled, was succeeded by the famous renegado Ochali, who reduced the kingdom of Tunis; which, however, remained subject to the viceroy of Algiers only till the year 1586, when a bashaw of Tunis was appointed by the Porte.

The kingdom of Algiers continued to be governed, till the beginning of the seventeenth century, by viceroys or bashaws appointed by the Porte; concerning whom we find nothing very remarkable, further than that their avarice and tyranny was intolerable both to the Algerines and the Turks themselves. At last the Turkish Janisaries and militia becoming powerful enough to suppress the tyrannic sway of these bashaws, and the people being almost exhausted by the heavy taxes laid upon them, the former resolved to depose these petty tyrants, and set up some officers of their own at the head of the realm. The beter to succeed in this attempt, the militia sent a deputation of some of their chief members to the Porte, to complain of the avarice and oppression of these bashaws, who sunk both the revenue of the state, and the money remitted to it from Constantinople, into their own coffers, which should have been employed in keeping up and paying the soldiery: by which means they were in continual danger of being overpowered by the Arabians and Moors, who, if ever so little assisted by any Christian power, would hardly fail of driving all the Turks out of the kingdom. They represented to the Grand Vizir how much more honourable, as well as easier and cheaper, it would be for the grand Signior to permit them to choose their own dey, or governor, from among themselves, whose interest it would then be to see that the revenue of the kingdom was rightly applied in keeping up its forces complete, and in supplying all other exigencies of the state, without any farther charge or trouble to the Porte than that of allowing them its protection. On their part, they engaged always to acknowledge the Grand Signiors as their sovereigns, and to pay them their usual allegiance and tribute, to respect their bashaws, and even to lodge and maintain them and their retinue, in a manner suitable to their dignity, at their own charge. The bashaws, however, were, for the future, to be excluded from assisting at any but general douwans, unless invited to it; and from having the liberty of voting in them, unless when their advice was asked, or the interest of the Porte was likely to suffer by their silence. All other concerns, which related to the government of Algeries, were to be wholly left under the direction of the dey and his douwan.

These proposals having been accepted by the Porte, the deputies returned highly satisfied; and having notified their new privileges, the great *douwan* immediately proceeded to the election of a dey from among themselves. They compiled a new set of laws, and made several regulations for the better support and maintenance of this new form of government, to the observation of which they obliged all their subjects to swear; and the militia, navy, commerce, &c. were all settled pretty nearly on the footing upon which they now are, and which shall be afterwards described; tho' the subsequent altercations that frequently happened between the bashaws and deys, the one endeavouring to recover their former power, and the other to curtail it, caused such frequent complaints and discontents at the Ottoman court, as made them frequently repent their compliance.

32 Algerines allowed to chuse their own deys.

In the year 1601, the Spaniards, under the command of Doria the Genoese admiral, made another attempt upon Algiers, in which they were more fortunate than usual, their fleet being only driven back by contrary winds, so that they came off without loss. In 1609, the Moors being expelled from Spain, flocked in great numbers to Algiers; and as many of them were very able sailors, they undoubtedly contributed to make the Algerine fleet so formidable as it became soon after; tho' it is probable the frequent attempts made on their city would also induce them to increase their fleet. In 1616, their fleet consisted of 40 sail of ships between 200 and 400 tons, their admiral 500 tons. It was divided into two squadrons, one of 18 sail, before the port of Malaga; and the other at the Cape of Santa Maria, between Lisbon and Seville; both of which fell foul on all Christian ships, both English and French, with whom they pretended to be in friendship, as well as Spaniards and Portuguese, with whom they were at war.

The Algerines were now become very formidable to the European powers. The Spaniards, who were most in danger, and least able to cope with them, solicited the assistance of England, the pope, and other states. The French, however, were the first who dared to show their resentment of the perfidious behaviour of these miscreants; in 1617, M. Beaulieu was sent against them with a fleet of 50 men of war, who defeated their fleet, took two of their vessels, while their admiral sunk his own ship and crew, rather than fall into his enemies hands.

33 They grow formidable to the Europeans.

In 1620, a squadron of English men of war was sent against Algiers, under the conduct of Sir Robert Mansel;

Algiers.

34 An Engliſh ſquadron ſent againſt the Algerines.

Manſel; but of this expedition we have no other account, than that it returned without doing any thing; and the Algerines, becoming more and more inſolent, openly defied all the European powers, the Dutch only excepted; to whom, in 1625, they ſent a propoſal, directed to the prince of Orange, that in caſe they would fit out 20 ſail of ſhips the following year, upon any good ſervice againſt the Spaniards, they would join them with 60 ſail of their own.

The next year, the *Coulolies*, or *Cologlies* (the children of ſuch Turks as had been permitted to marry at Algiers), who were enrolled in the militia, having ſeized on the citadel, had well nigh made themſelves maſters of the city; but were attacked by the Turks and renegadoes, who defeated them with terrible ſlaughter. Many ſcores of them were executed; and their heads thrown in heaps upon the city-walls, without the eaſtern gate. Part of the citadel was blown up; and the remaining Coulolies were diſmiſſed from the militia, to which they were not again admitted till long after.

35 States of Barbary throw off their dependence on the Porte.

In 1623, the Algerines and other ſtates of Barbary threw off their dependence on the Porte altogether, and ſet up for themſelves. What gave occaſion to this was the 25 years truce which Sultan Amurath IV. was obliged to make with the emperor Ferdinand II. to prevent his being overmatched by carrying on the war againſt him and the ſophi of Perſia at the ſame time. As this put a ſtop to the piratical trade of the Algerines, they proceeded as abovementioned; and reſolved, that whoever deſired to be at peace with them, muſt, diſtinctly and ſeparately, apply to their government.—No ſooner was this reſolution taken, than the Algerines began to make prizes of ſeveral merchant ſhips belonging to powers at peace with the Porte. Nay, having ſeized a Dutch ſhip and poleacre at Scanderoon, they ventured on ſhore; and finding the town abandoned by the Turkiſh aga and inhabitants, they plundered all the magazines and warehouſes, and ſet them on fire.—About this time Lewis XIII. undertook to build a fort on their coaſts, inſtead of one formerly built by the Marſilians, and which they had demoliſhed. This, after ſome difficulty, he accompliſhed; and it was called the *Baſtion of France*: but the ſituation being afterwards found inconvenient, the French purchaſed the port of La Calle, and obtained liberty to trade with the Arabians and Moors. The Ottoman court, in the mean time, was ſo much embarraſſed with the Perſian war, that there was no leiſure to check the Algerine piracies. This gave an opportunity to the vizir and other courtiers to compound matters with the Algerines, and to get a ſhare of their prizes, which were very conſiderable. However, for form's ſake, a ſevere reprimand, accompanied with threats, was ſent them; to which they replied, that "theſe depredations deſerved to be indulged to them, ſeeing they were the only bulwark againſt the Chriſtian powers, eſpecially againſt the Spaniards, the ſworn enemies of the Moſlem name." Adding, that "if they ſhould pay a punctilious regard to all that would purchaſe peace, or liberty to trade with the Ottoman empire, they would have nothing to do but ſet fire to all their ſhipping, and turn camel-drivers for a livelihood."

36 Deſperate undertaking of four younger brothers.

In the year 1635, four younger brothers of a good family in France, entered into an undertaking ſo deſperate, that perhaps the annals of knight-errantry can ſcarce furniſh its equal.—This was no leſs than to retort the piracies of the Algerines upon themſelves; and as they indiſcriminately took the ſhips of all nations, ſo were theſe heroes indiſcriminately to take the ſhips belonging to Algiers; and this with a ſmall frigate of ten guns!—In this ridiculous undertaking, 100 volunteers embarked; a Malteſe commiſſion was procured, together with an able maſter, and 36 mariners.—They had the good fortune, on their firſt ſetting out, to take a ſhip laden with wine, on the Spaniſh coaſt: with which they were ſo much elated, that three days after they madly encountered two large Algerine corſairs, one of 20 and the other of 24 guns, both well manned, and commanded by able officers. Theſe two large veſſels having got the ſmall frigate between them, plied her furiouſly with great ſhot, which ſoon took off her main maſt: notwithſtanding which, the French made ſo deſperate a reſiſtance, that the pirates were not able to take them, till the noiſe of their fire brought up five more Algerines; when the French veſſel, being almoſt torn to pieces, was boarded and taken. The young knights-errant were puniſhed for their temerity by a dreadful captivity, from which they redeemed themſelves in 1642 at the price of 6000 dollars.

37 A French admiral carries off the Turkiſh baſhaw.

The Algerines proſecuted their piracies with impunity, to the terror and diſgrace of the Europeans, till the year 1652; when a French fleet being accidentally driven to Algiers, the admiral took it into his head to demand a releaſe of all the captives of his nation, without exception. This being refuſed, the Frenchman without ceremony carried off the Turkiſh viceroy, and his cadi or judge, who were juſt arrived from the Porte, with all their equipage and retinue. The Algerines, by way of repriſal, ſurpriſed the Baſtion of France already mentioned, and carried off the inhabitants to the number of 600, with all their effects; which ſo provoked the admiral, that he ſent them word that he would pay them another viſit the next year with his whole fleet.

38 The Algerines fit out a formidable fleet,

The Algerines, undiſmayed by the threats of the French admiral, fitted out a fleet of 16 galleys and galliots, excellently manned and equipped, under the command of Admiral Hali Pinchinin.—The chief deſign of this armament was againſt the treaſure of Loretto; which, however, they were prevented by contrary winds from obtaining. Upon this they made a deſcent on Puglia in the kingdom of Naples; where they ravaged the whole territory of Necotra, carrying off a vaſt number of captives, and among them ſome nuns. From thence ſteering towards Dalmatia, they ſcoured the Adriatic; and loading themſelves with immenſe plunder, left thoſe coaſts in the utmoſt conſternation and reſentment.

39 Which is totally deſtroyed by the Venetians.

At laſt the Venetians, alarmed at ſuch terrible depredations, equipped a fleet of 28 ſail, under the command of admiral Capello, with expreſs orders to burn, ſink, or take, all the Barbary corſairs he met with, either on the open ſeas, or even in the Grand Signior's harbours, purſuant to a late treaty of peace with the Porte. On the other hand, the captain baſhaw, who had been ſent out with the Turkiſh fleet to chaſe the Florentine and Malteſe cruiſers out of the Archipelago, underſtanding that the Algerine ſquadron was ſo near, ſent expreſs orders to the admiral to come to his aſſiſtance. Pinchinin readily agreed; but having firſt reſolved on a deſcent upon the iſland of Liſſa, or Liſina, Algiers. na, belonging to the Venetians, he was overtaken by Capello, from whom he retired to Valona, a sea-port belonging to the Grand Signior, whither the Venetian admiral pursued him; but the Turkish governor refusing to eject the pirates according to the articles of the peace between the Ottoman court and Venice, Capello was obliged to content himself with watching them for some time. Pinchinin was soon weary of restraint, and ventured out; when an engagement immediately ensued, in which the Algerines were defeated, and five of their vessels disabled; with the loss of 1500 men, Turks, and Christian slaves; besides 1600 galley-slaves, who regained their liberty. Pinchinin, after this defeat, returned to Vallona, where he was again watched by Capello; but the latter had not lain long at his old anchorage before he received a letter from the senate, desiring him to make no farther attempt on the pirates at that time, for fear of a rupture with the Porte. This was followed by a letter from the governor of Valona, desiring him to take care lest he incurred the Sultan's displeasure by such insults. The brave Venetian was forced to comply; but, resolving to take such a leave of the Algerines as he thought they deserved, observed how they had reared their tents, and drawn their booty and equipage along the shore. He then kept firing among their tents, while some well-manned galliots and brigantines were ordered among their shipping, who attacked them with such bravery, that, without any great loss, they towed out their 16 galleys, with all their cannon, stores, &c.—In this last engagement, a ball from one of the Venetian galleys happening to strike a Turkish mosque, the whole action was considered as an insult upon the Grand Signior. To conceal this, Capello was ordered to sink all the Algerine ships he had taken, except the admiral; which was to be conducted to Venice, and laid up as a trophy. Capello came off with a severe reprimand; but the Venetians were obliged to buy, with 500,000 ducats, a peace from the Porte. The Grand Signior offered to repair the loss of the Algerines by building ten galleys for them, upon condition that they should continue in his service till the end of the ensuing summer; but Pinchinin, who knew how little the Algerines chose to lie under obligations to him, civilly declined the offer.

40 Algiers in the utmost confusion at the news.

In the mean time, the news of this defeat and loss filled Algiers with the utmost grief and confusion. The whole city was on the point of a general insurrection, when the bashaw and douwan issued out a proclamation, forbidding, not only complaints and outcries, under the severest penalties; but all persons whatever to *take their thumbs from within their girdles*, while they were deliberating on this important point. In the mean time, they applied to the Porte for an order, that the Venetians settled in the Levant should make up their loss. But with this the Grand Signior refused to comply, and left them to repair their losses, as well as build new ships, in the best manner they could. It was not long, however, before they had the satisfaction to see one of their corsairs land, with a fresh supply of 600 slaves, whom he had brought from the coast of Iceland, whither he had been directed by a miscreant native taken on board a Danish ship.

41 They set out a new fleet.

Our pirates did not long continue in their weak and defenceless state; being able, at the end of two years, to appear at sea with a fleet of 65 sail. The admiral Pinchinin equipped four galliots at his own expence; with which, in conjunction with the Chiayah, or secretary of the bashaw of Tripoli, he made a second excursion. This small squadron, consisting of five galleys and two brigantines, fell in with an English ship of 40 guns; which, however, Pinchinin's captains refused to engage; but being afterwards reproached by him for their cowardice, they swore to attack the next Christian ship which came in their way. This happened to be a Dutch merchantman, of 28 guns and 40 men, deeply laden, and unable to use her sails by reason of a calm. Pinchinin immediately summoned her to surrender; but receiving an ironical answer, drew up his squadron in form of an half-moon, that they might pour their shot all at once into their adversary. This, however, the Dutchman avoided, by means of a breeze of wind which fortunately sprung up and enabled him to turn his ship; upon which the gallays ran foul of each other.—Upon this, Pinchinin ran his own galley along side of the merchantman, the upper deck of which 70 Algerines immediately took possession of, some of them cutting the rigging, and others plying the hatches with hand-grenadoes: but the Dutchmen having secured themselves in their close quarters, began to fire at the Algerines on board, from two pieces of cannon loaded with small shot; by which they were all soon killed, or forced to submit. Pinchinin, in the mean time, made several unsuccessful attempts to relieve his men, as well as to surround the Dutchman with his other galleys: but that ship lay so deep in the water, that every shot did terrible execution among the pirates; so that they were obliged to remove farther off. At last the Dutch captain, having ordered his guns to be loaded with cartouches, gave them such a parting volley as killed 200 of them, and sent the rest back to Algiers in a most dismal plight.

42 Five of their galleys defeated by a Dutch merchantman.

But though Pinchinin thus returned in disgrace, the rest of the fleet quickly came back with vast numbers of slaves, and an immense quantity of rich spoils; insomuch that the English, French, and Dutch, were obliged to cringe to the mighty Algerines, who sometimes vouchsafed to be at peace with them, but swore eternal war against Spain, Portugal, and Italy, whom they looked upon as the greatest enemies to the Mahometan name. At last Lewis XIV. provoked by the grievous outrages committed by the Algerines on the coasts of Provence, and Languedoc, ordered, in 1681, a considerable fleet to be fitted out against them, under the Marquis du Quesne, vice-admiral of France. His first expedition was against a number of Tripolitan corsairs; who had the good fortune to outrow him, and shelter themselves in the island of Scio belonging to the Turks. This did not, however, prevent him from pursuing them thither, and making such terrible fire upon them as quickly destroyed 14 of their vessels, besides battering the walls of the castle.

43 Preparations against Algiers by Lewis XIV.

This severity seemed only to be designed as a check to the piracies of the Algerines; but, finding they still continued their outrages on the French coast, he sailed to Algiers in August 1682, cannonading and bombarding it so furiously, that the whole town was in flames in a very little time. The great mosque was battered down, and most of the houses laid in ruins, insomuch that the inhabitants were on the point of abandoning the place; when on a sudden the wind turned about, and

44 Algiers bombarded and set on fire by the French.

and obliged Du Queſne to return to Toulon. The Algerines immediately made repriſals, by ſending a number of galleys and galliots to the coaſts of Provence,

45 Algerines commit dreadful ravages in France.

where they committed the moſt dreadful ravages, and brought away a vaſt number of captives : upon which a new armament was ordered to be got ready at Toulon and Marſeilles againſt the next year ; and the Algerines, having received timely notice, put themſelves into as good a ſtate of defence as the time would allow.

46 The city again bombarded.

In May 1683, Du Queſne with his ſquadron caſt anchor before Algiers ; where, being joined by the Marquis D'Affranville, at the head of five ſtout veſſels, it was reſolved to bombard the town next day. Accordingly 100 bombs were thrown into it the firſt day, which did terrible execution ; while the beſieged made ſome hundred diſcharges of their cannon againſt them, without doing any conſiderable damage. The following nights the bombs were again thrown into the city in ſuch numbers, that the dey's palace and other great edifices were almoſt deſtroyed; ſome of their batteries were diſmounted, and ſeveral veſſels ſunk in the port. The dey and Turkiſh baſhaw, as well as the whole ſoldiery, alarmed at this dreadful havock, immediately ſued for peace. As a preliminary, the immediate ſurrender was inſiſted on of all Chriſtian captives who had been taken fighting under the French flag ; which being granted, 142 of them were immediately delivered up, with a promiſe of ſending him the remainder as ſoon as they could be got from the different parts of the country. Accordingly Du Queſne ſent his commiſſary-general and one of his engineers into the town ; but with expreſs orders to inſiſt upon the delivery of all the French captives without exception, together with the effects they had taken from the French ; and that Mezomorto their then admiral, and Hali Rais one of their captains, ſhould be given as hoſtages.

This laſt demand having embarraſſed the dey, he aſſembled the douwan, and acquainted them with it : upon which Mezomorto fell into a violent paſſion, and told the aſſembly, that the cowardice of thoſe who ſat at the helm had occaſioned the ruin of Algiers ; but that, for his part, he would never conſent to deliver up any thing that had been taken from the French. He immediately acquainted the ſoldiery with what had paſſed; which ſo exaſparated them, that they murdered the dey that very night, and on the morrow choſe Mezomorto in his place. This was no ſooner done, than he cancelled all the articles of peace which had been made, and hoſtilities were renewed with greater fury than ever.

47 Set on fire and almoſt deſtroyed.

The French admiral now kept pouring in ſuch volleys of bombs, that, in leſs than three days, the greateſt part of the city was reduced to aſhes, and the fire burnt with ſuch vehemence, that the ſea was enlightened with it for more than two leagues round. Mezomorto, unmoved at all theſe diſaſters, and the vaſt number of the ſlain, whoſe blood ran in rivulets along the ſtreets ; or rather, grown furious and deſperate, ſought only how to wreak his revenge on the enemy; and, not content with cauſing all the French in the city to be cruelly murdered, ordered their conſul to be tied hand and foot, and faſtened alive to the mouth of a mortar, from whence he was ſhot away againſt their navy— By this piece of inhumanity Du Queſne was ſo exaſperated, that he did not leave Algiers till he had utterly deſtroyed all their fortifications, ſhipping, almoſt all the lower part, and above two thirds of the upper part, of the city ; by which means it became little elſe than a heap of ruins.

48 Algerines ſue for peace.

The haughty Algerines were now thoroughly convinced that they were not invincible ; and, therefore, immediately ſent an embaſſy into France, begging in the moſt abject terms for peace ; which Lewis immediately granted, to their inexpreſſible joy. They now began to pay ſome regard to other nations, and to be a little cautious how they wantonly incurred their diſpleaſure. The firſt bombardment by the French had ſo far humbled the Algerines, that they condeſcended to enter into a treaty with England; which was renewed, upon terms very advantageous to the latter, in 1686. It is not to be ſuppoſed, however, that the natural perfidy of the Algerines would diſappear on a ſudden ; notwithſtanding this treaty, therefore, they loſt no opportunity of making prizes of the Engliſh ſhips when they could conveniently come at them. Upon ſome infringement of this kind, Captain Beach drove aſhore and burnt ſeven of their frigates in 1695 ; which produced a renewal of the treaty five years after : but it was not till the taking of Gibraltar and Port Mahon, that Britain could have a ſufficient check upon them to enforce the obſervation of treaties : and theſe have ſince proved ſuch reſtraints upon Algiers, that they ſtill continue to pay a greater deference to the Engliſh than to any European power.

49 Seven of their ſhips burnt by capt Beach.

50 Expulſion of the Turkiſh baſhaw.

The preſent century furniſhes no very remarkable events with regard to Algiers; except the taking of the famed city of Oran from the Spaniards in 1708 (which however they regained in 1737), and the expulſion of the Turkiſh baſhaw, and uniting his office to that of dey in 1710. This introduced the form of government which ſtill continues in Algiers.

51 Revenues, &c. of the Dey.

The dey is now abſolute monarch ; and pays no other revenue to the Porte, than that of a certain number of fine boys or youths, and ſome other preſents which are ſent thither yearly. His own income, probably riſes and falls according to the opportunities he hath of fleecing both natives and foreigners; whence it is variouſly computed by different authors. Dr Shaw computes the taxes of the whole kingdom to bring into the treaſury no more than 300,000 dollars; but ſuppoſes that the eighth part of the prizes, the effects of thoſe perſons who die without children, joined to the yearly contributions raiſed by the government, preſents from foreigners, fines and oppreſſions, may bring in about as much more. Both the dey, and officers under him, enrich themſelves by the ſame laudable methods of rapine and fraud ; which it is no wonder to find the common people practiſing upon one another, and eſpecially upon ſtrangers, ſeeing they themſelves are impoveriſhed by heavy taxes and the injuſtice of thoſe who are in authority.

We have already hinted, that the firſt deys were elected by the militia, who were then called the *douwan* or common-council. This elective body was at firſt compoſed of 800 militia-officers, without whoſe conſent the dey could do nothing : and upon ſome urgent occaſions, all the officers reſiding in Algiers, amounting to above 1500, were ſummoned to aſſiſt. But ſince the deys, who may be compared to the Dutch

Algiers. Stadtholders, have become more powerful, the douwan is principally composed of 30 chiak-bashaws, or colonels, with now and then the mufti and cadi upon some emergencies; and on the election of a dey, the whole soldiery are allowed to come and give their votes. All the regulations of state ought to be determined by that assembly, before they pass into a law, or the dey hath power to put them in execution: but, for many years back, the douwan is of so little account, that it is only convened out of formality, and to give assent to what the dey and his chief favourites have concerted beforehand. The method of gathering the votes in this august assembly is perfectly agreeable to the character of those who compose it. The aga, or general of the janisaries, or the president *pro tempore*, first proposes the question; which is immediately repeated with a loud voice by the chiak-bashaws, and from them echoed again by four officers called *bashaldalas*, from these the question is repeated from one member of the douwan to another, with strange contortions, and the most hideous growlings, if it is not to their liking. From the loudness of this growling noise, the aga is left to guess as well as he can whether the majority of the assembly are pleased or displeased with the question; and from such a preposterous method, it is not surprising that these assemblies should seldom end without some tumult or disorder. As the whole body of the militia is concerned in the election of a new dey, it is seldom carried on without blows and bloodshed: but when once the choice is made, the person elected is saluted with the words ALLA BARICK, "God bless you, and prosper you;" and the new dey usually causes all the officers of the douwan who had opposed his election to be strangled, filling up their places with those who had been most zealous in promoting it. From this account of the election of the deys, it cannot be expected that their goverment should be at all secure; and as they arrive at the throne by tumult, disorder, and bloodshed, they are generally deprived of it by the same means, scarcely one in ten of them having the good fortune to die a natural death.

52 Strange method of gathering the votes of the douwan.

In this country it is not to be expected that justice will be administered with any degree of impartiality.

53 Punishments, &c.

The Mahometan soldiery, in particular, are so much favoured, that they are seldom put to death for any crime, except rebellion; in which case they are either strangled with a bow-string, or hanged to an iron hook. In lesser offences, they are fined, or their pay stopped; and if officers, they are reduced to the station of common soldiers, from whence they may gradually raise themselves to their former dignity. Women guilty of adultery, have a halter tied about their necks, with the other end fastened to a pole, by which they are held under water till they are suffocated. The bastinado is likewise inflicted for small offences; and is given either upon the belly, back, or soles of the feet, according to the pleasure of the cadi; who also appoints the number of strokes. These sometimes amout to 200 or 300, according to the indulgence the offender can obtain either by bribery or friends; and hence he often dies under this punishment, for want of powerful enough advocates. But the most terrible punishments are these inflicted upon the Jews or Christians who speak against Mahomet or his religion; in which case, they must either turn Mahometan, or be impaled alive. If they afterwards apostatize, they are burned or roasted alive, or else thrown down from the top of the city-walls upon iron hooks, where they are caught by different parts of their body, according as they happen to fall, and sometimes expire in the greatest torments; though by accident they may be put out of pain at once, as we have already related of the Spanish adventurer John Gascon. This terrible punishment, however, begins now to be disused.

54 Aga of the janizaries and other military officers.

The officer next in power to the dey is the aga of the janisaries, who is one of the oldest officers in the army, and holds his post only for two months. He is then succeeded by the chiah, or next senior officer.—During the two months in which the aga enjoys his dignity, the keys of the metropolis are in his hands; all military orders are issued out in his name; and the sentence of the dey upon any offending soldier, whether capital or not, can only be executed in the court of his palace.—As soon as he is gone through this short office, he is considered as *mazoul*, or superannuated; receives his pay regularly, like the rest of the militia every two moons; is exempt from all other duties, except when called by the dey to assist at the grand council, to which he hath, however, a right to come at all times, but hath no longer a vote in it.—Next to the aga in dignity, is the secretary of state, who registers all the public acts; and after him are the 30 chiahs or colonels, who sit next to the aga in the douwan, and in the same gallery with him. Out of this class are generally chosen those who go embassadors to foreign courts, or who disperse the dey's orders throughout the realm.—Next to them are 800 balluck-bashaws, or eldest captains, who are promoted to that of chiah-bashaws, according to their seniority. The oldack-bashaws, or lieutenants, are next; who amount to 400, and are regularly raised to the rank of captains in their turn, and to other employments in the state, according to their abilities. These, by way of distinction, wear a leather strap, hanging down to the midle of their back. One rule is strictly observed in the rotation of these troops from one deputy to a higher; viz. the right of seniority; one single infringement of which would cause an insurrection, and probably cost the dey his life. Other military officers of note are the vekelards, or purveyors of the army; the peys, who are the four oldest soldiers, and consequently the nearest to preferment; the foulacks, who are the next in seniority to them, and are part of the dey's body-guard, always marching before him when he takes the field, and distinguished by their carbines and gilt scymiters, with a brass gun on their caps; the kayts, or Turkish soldiers, each band of whom have the government of one or more adowars, or itinerant villages, and collect their taxes for the dey; and the sagiards, or Turkish lancemen, 100 of whom always attend the army, and watch over the water appointed for it. To these we may add the beys, or governors of the three great provinces of the realm. All the abovementioned officers ought to compose the great douwan or council abovementioned; but only the 30 chiah-bashaws have a right to sit in the gallery next after the dey; the rest are obliged to stand on the floor of the hall, or council-chamber, with their arms across, and, as much as possible, without motion; neither are they permitted to enter with their swords on, for fear of a tumult. As for those who

Algiers. who have any matters to transact with the douwan, they must stand without, let the weather be ever so bad; and there they are commonly presented with coffee by some of the inferior officers, till they are dismissed.

55 Division of the kingdom

The kingdom of Algiers is at present divided into three provinces or districts, viz. the eastern, western, and southern. The eastern, or Levantine government, which is by far the most considerable of the three, and is also called *Beylick*, contains the towns of Boano, Constantina, Gigeri, Bujeyah, Stessa, Tebef, Zamoura, Biscara, and Necanz, in all which the Turks have their garrisons: besides which, it includes the two ancient kingdoms of Cuco and Labez, though independent of the Algerine government, to whose forces their country is inaccessible; so that they still live under their own cheyks chosen by each of their adowars or hords. To these we may add a French factory at Callo, under the direction of the company of the French Bastion.—The western government hath the towns of Oran, Tremecen, Mostagan, Tenez, and Secrelly with its castle and garrison.—The southern government hath neither town, village, nor even a house, all the inhabitants living in tents, which obliges the dey and his forces to be always encamped.

56 Rivers.

The most considerable rivers of Algiers are the Zha, or Ziz, which runs across the province of Tremecen, and the desert of Anguid, falling into the Mediterranean near the town of Tabecrita, where it has the name of *Sirut*. (2.) The Haregol, supposed the *Sign* of Ptolemy, comes down from the great Atlas, crosses the desart of Anguid, and falls into the sea, about five leagues from Oran. (3.) The Mina, supposed the *Chylematis* of Ptolemy, a large river, which runs through the plains of Bathala, and falls into the sea near the town of Arzew. This river hath lately received the name of *Cena*, who rebuilt the town of Bathalah after it had been destroyed. (4.) The Shelif, Zilef, or Zilif, descending from the mount Gnanexeris, runs through some great desarts, the lake Titteri, the frontiers of Tremecen and Tenez, falling into the sea a little above the city of Mostagan. (5.) The Celef, supposed to be the *Carthena* of the ancients, falls into the sea about three leagues west of Algiers, after a short course of 18 or 20 leagues. (6.) The Hued-al-quivir, supposed to be the *Nalabata*, or *Nasaba*, of the ancients, and called by the Europeans *Zinganir*, runs down with a swift course, through some high mountains of Cuco, and falls into the sea near Bujeyah.

57 Harbour of Bujeyah cleared by accident.

Whilst the city of Bujeyah was in the hands of the Christians, the mouth of this river was so choaked up with sand, that no vessel could come up into it: but in 1555, very soon after it was taken by the Moors, the great rains swelled it to such a degree, that all the sand and mud was carried off; so that galleys, and other vessels, have ever since entered it with ease, where they lie safe from storms, and all winds, but that which blows from the north. (7.) Suf-Gemar, or Suf-Gimmar al Rumniel, supposed to be the *Ampsaga* of Ptolemy, hath its source on mount Auras, on the confines of Atlas; thence runs through some barren plains, and the fruitful ones of Constantina, where its stream is greatly increased by some other rivers it receives; from thence running northward, along the ridges of some high mountains, it falls into the sea a little east of Gigeri. (8.) The Ladag, or Ludeg, runs down from mount Atlas through part of Constantina, and falls into the sea a little eastward of Bona. (9.) Guadi, or Gaudel Barbar, springs from the head of Orbus, or Urbs, in Tripoli, runs through Bujeyah, and falls into the sea near Tabarea.

58 Account of the corsairs, commerce, &c.

Besides these there are many others of less note; of which, however, we do not find that the Algerines avail themselves as they might do, their genius leading them too much to the piratical trade to mind any real advantage that might be derived from their own country. The corsairs, or pirates, form each a small republic, of which the rais or captain is the supreme bashaw; who, with the officers under him, form a kind of douwan, in which every matter relating to the vessel is decided in an arbitrary way. These corsairs are chiefly instrumental in importing whatever commodities are brought into the kingdom either by way of merchandise or prizes. These consist chiefly of gold and silver stuffs, damasks, cloths, spices, tin, iron, plated brass, lead, quicksilver, cordage, sail-cloth, ballets, cochineal, linen, tartar, alum, rice, sugar, soap, cotton raw and spun, copperas, aloes, brazil and logwood, vermilion, &c. Very few commodities, however, are exported from this part of the world: the oil, wax, hides, pulse, and corn produced, being but barely sufficient to supply the country; though, before the loss of Oran, the merchants have been known to ship off from one or other of the ports of Barbary several thousand tons of corn. The consumption of oil, though here in great abundance, is likewise so considerable in this kingdom, that it is seldom permitted to be shipped off for Europe. The other exports consist chiefly in ostriches feathers, copper, ruggs, silk sashes, embroidered handkerchiefs, dates, and Christian slaves. Some manufactures in silk, cotton, wool, leather, &c. are carried on in this country, but mostly by the Spaniards settled here, especially about the metropolis. Carpets are also a manufacture of the country, which, though much inferior to those of Turkey, both in beauty and fineness, are preferred by the people to lie upon, on account of their being both cheaper and softer. There were also, at Algiers, looms for velvet, taffeties, and other wrought silks; and a coarse sort of linen is likewise made in most parts of the kingdom. The country furnishes no materials for ship-building. They have neither ropes, tar, sails, anchors, nor even iron. When they can procure enough of new wood to form the main timbers of a ship, they supply the rest from the materials of prizes which they have made; and thus find the secret of producing new and swift sailing vessels from the ruins of the old. Of all the states on the coast of Barbary, the Algerines are the strongest at sea.

58 Inhabitants.

The inhabitants along the sea-coasts are a mixture of different nations; but chiefly Moors and Morescos driven out of Catalonia, Arragon, and other parts of Spain. Here are also great numbers of Turks, who come from the Levant to seek their fortune; as well as multitudes of Jews and Christians taken at sea, who are brought hither to be sold for slaves. The BereberS are some of the most ancient inhabitants of the country; and are supposed to be descended from the ancient Sabeans, who came hither from Arabia Felix, under the conduct of one of their princes. Others be-

Algiers.

lieve them to be some of the Canaanites driven out of Palestine by Joshua. These are dispersed all over Barbary, and divided into a multitude of tribes under their respective chiefs: most of them inhabit the mountainous parts; some range from place to place, and live in tents, or portable huts; others in scattered villages: they have, nevertheless, kept themselves for the most part from intermixing with other nations. The Berebers are reckoned the richest of all, go better cloathed, and carry on a much larger traffic of cattle, hides, wax, honey, iron, and other commodities. They have also some artificers in iron, and some manufacturers in the weaving branch.—The name of *Bereber* is supposed to have been originally given them on account of their being first settled in some desart place. Upon their increasing in process of time, they divided themselves into five tribes, probably on account of religious differences, called the *Zinhagians*, *Musamedins*, *Zeneti*, *Hoares*, and *Gomeres*: and these having produced 600 families, subdivided themselves into a great number of petty tribes.—To these we may add the *Zwowahs*, by European authors called *Azuagues*, or *Assagues*, who are likewise dispersed over most parts of Barbary and Numidia. Great numbers of these inhabit the mountainous parts of Cuco, Labez, &c. leading a wandering pastoral life.—But the most numerous inhabitants are the Moors and Arabians. The former are very stout and warlike, and skilful horsemen; but so addicted to robbing, that one cannot safely travel along the country at a distance from the towns without a guard, or at least a marabout or saint for a safeguard. For as they look upon themselves to be the original proprietors of the country, and not only as dispossessed by the rest of the inhabitants, but reduced by them to the lowest state of poverty, they make no scruple to plunder all they meet by way of reprisal. The inhabitants, in general, have a pretty fair complexion; they are robust and well proportioned. People of distinction wear their beards; they have rich clothes made of silk, embroidered with flowers of gold, and turbans enriched with jewels. The Turks, who compose the military force, have great privileges, pay no taxes, are never publicly punished, and rarely in private. The lowest soldier domineers over the most distinguished Moors at pleasure. If he finds them better mounted than himself, he exchanges horses without ceremony. The Turks alone have the privilege of carrying fire-arms. Many good qualities, however, distinguish them in spite of this excess of despotism. They never game for money, not even for trifles; and they never profane the name of the Deity. They soon forget their private quarrels; and after the first paroxysm of resentment is over, it is infamy for a Turk to keep in remembrance the injuries he has received. In this respect certainly they are less barbarous than other nations that boast of their civilization. See Moors.

Algiers, a city, the capital of the above kingdom, is probably the ancient *Icosium*: by the Arabians called *Algezair*, or rather *Al-Jezier*, or *Al-Jezerah*, i. e. *the island*, because there was an island before the city, to which it hath been since joined by a mole. It is built on the declivity of a hill by the sea-side, in the form of an amphitheatre: at sea, it looks like the topsail of a ship. The tops of the houses are quite flat and white; insomuch, that when it is first discovered, one would take it to be a place where they bleach linen. One house rises above another in such a manner that they do not hinder each other's prospect. The streets are so narrow, that they will scarce admit two persons to walk a-breast, and the middle part is lower than the sides. When any loaded beasts, such as camels, horses, mules, or asses, pass along, you are forced to stand up close to the wall to let them pass by. There is but one broad street, which runs through the city from east to west, in which are the shops of the principal merchants, and the market for corn and other commodities. The lower part of the walls of the city are of hewn stone, and the upper part of brick: they are 30 feet high on the land side, and 40 towards the sea; the fosses or ditches are twenty feet broad, and seven deep. There is no sweet water in the city; and tho' there is a tank or cistern in every house, yet they often want water, because it rains but seldom: the chief supply is from a spring on a hill, the water of which is conveyed by pipes to above a hundred fountains, at which a bowl is fastened for the use of passengers. The common reservoir is at the end of the mole, where the ships take in their water. Every one takes his turn at these places, except the Turks, who are first, and the Jews last. There are five gates, which are open from sun-rising till sun-setting; and seven forts, or castles, without the walls, the greatest of which is on the mole without the gate, all of which are well supplied with great guns. There are ten large mosques, and fifty small ones; three great colleges or public schools, and a great number of petty ones for children. The houses are square, and built of stone and brick, with a square court in the middle, and galleries all round. There are said to be about 100,000 inhabitants in the city, comprehending 5000 Jewish families, besides Christians. There are four fundics, or public inns, such as are in Turkey; and six cazernes, or barracks, for the unmarried Turkish soldiers, which will hold 600 each. There are no inns for Christians to lodge at; but only a few tippling huts kept by slaves, for the accommodation of Greeks and the poorer sort of travellers, where any thing may be had for money. Here are bagnios, or public baths, in the same manner as in Turkey, at a very moderate rate. The women have baths of their own, where the men dare not come. Without the city there are a great number of sepulchres, as also cells or chapels, dedicated to marabouts, or reputed saints, which the women go to visit every Friday. The Turkish soldiers are great tyrants; for they not only turn others out of the way in the streets, but will go to the farm-houses in the country for twenty days together, living on free quarters, and making use of every thing, not excepting the women. The Algerines eat, as in Turkey, sitting cross-legged round a table about four inches high, and use neither knives nor fork; before they begin, every one says *Be isme Allah*, "In the name of God." When they have done, a slave pours water on all their hands as they sit, and then they wash their mouths. Their drink is water, sherbet, and coffee. Wine is not allowed, though drank immoderately by some. The prospect of the country and sea from Algiers is very beautiful, being built on the declivity of a mountain: but the city, though for several ages it has braved some of the greatest powers in Christendom, it is said, could make but a faint defence against a regular siege; and that

that three English fifty-gun ships might batter it about the ears of its inhabitants from the harbour. If so, the Spaniards must have been very deficient either in courage or conduct. They attacked it in the year 1775, by land and by sea, but were repulsed with great loss; though they had near 20,000 foot and 2000 horse, and 47 king's ships of different rates and 346 transports. In the year 1783 and 1784, they also renewed their attacks by sea to destroy the city and galleys; but, after spending a quantity of ammunition, bombs, &c. were forced to retire without either its capture or extinction. The mole of the harbour is 500 paces in length, extending from the continent to a small island where there is a castle and large battery. E. Long. 3. 30. N. Lat. 36. 40.

ALGOL, a fixed star of the third magnitude, called *Medusa's Head*, in the constellation Perseus; its longitude is 21° 50′ 42″ of Taurus, and its latitude 23° 23′ 47″ north, according to Flamstead's catalogue. For an account of its changes, period, and other circumstances, see ASTRONOMY (*Index*.)

ALGONQUINS, a nation in North America, who formerly possessed great tracts of land along the north shore of the river St Lawrance. For a long time they had no rivals as hunters and warriors, and were long in alliance with the Iroquois; whom they agreed to protect from all invaders, and to let them have a share of their venison. The Iroquois, on the other hand, were to pay a tribute to their allies, out of the culture of the earth; and to perform for them all the menial duties, such as flaying the game, curing the flesh, and dressing the skins. By degrees, however, the Iroquois associated in the hunting matches and warlike expeditions of the Algonquins; so that they soon began to fancy themselves as well qualified, either for war or hunting, as their neighbours. One winter, a large detachment of both nations having gone out a-hunting, and secured, as they thought, a vast quantity of game, six young Algonquins and as many Iroquois were sent out to begin the slaughter. The Algonquins, probably became a little jealous of their associates, upon seeing a few elks, desired the Iroquois to return on pretence that they would have sufficient employment in flaying the game they should kill; but after three days hunting, having killed none, the Iroquois exulted, and in a day or two privately set out to hunt for themselves. The Algonquins were so exasperated at seeing their rivals return laden with game, that they murdered all the hunters in the night-time. The Iroquois dissembled their resentment; but in order to be revenged, applied themselves to study the art of war as practised among those savage nations. Being afraid of engaging with the Algonquins at first, they tried their prowess on other inferior nations, and, when they thought themselves sufficiently expert, attacked the Algonquins with such diabolical fury, as showed they could be satisfied with nothing less than the extermination of the whole race; which, had it not been for the interposition of the French, they would have accomplished.—The few Algonquin nations that are now to be seen, seem entirely ignorant of agriculture, and subsist by fishing and hunting. They allow themselves a plurality of wives; notwithstanding which, they daily decrease in populousness, few or none of their nations containing above 6000 souls, and many of them not 2000. Their language is one of the three radical ones in North America, being understood from the river St Lawrance to the Missisippi.

ALGOR, with physicians, an unusual coldness in any part of the body.

ALGORITHM, an Arabic word expressive of numerical computation.

ALGUAZIL, in the Spanish polity, an officer whose business it is to see the decrees of a judge executed.

ALHAGI, in botany, the trivial name of a species of hedysarum. See HEDYSARUM.

ALHAMA, a very pleasant town of the kingdom of Granada, in Spain, situated in the midst of some craggy mountains, about 25 miles S. W. of Granada, on the banks of the Rio Frio, in W. Long. 1. 10. N. Lat. 36. 59. and having the finest warm baths in all Spain. It was taken from the Moors in 1481.—The inhabitants, though surprised, and the town without a garrison, made a gallant defence: but being at length forced to submit, the place was abandoned to the pillage of the Christian soldiers; who, not satisfied with an immense quantity of gold and jewels, made slaves of upwards of 3000 of the inhabitants.

ALHAMBRA, the ancient fortress and residence of the Moorish monarchs of Granada. It derives its name from the red colour of the materials which it was originally built with, Alhambra signifying a red house. It appears to a traveller a huge heap of as ugly buildings as can well be seen, all huddled together, seemingly without the least intention of forming *one* habitation out of them. The walls are entirely unornamented, all gravel and pebbles, daubed over with plaster by a very course hand: yet this is the palace of the Moorish kings of Granada, indisputably the most curious place within that exists in Spain, perhaps in the world. In many countries may be seen excellent modern as well as ancient architecture, both entire and in ruins; but nothing to be met with any where else can convey an idea of this edifice, except the decorations of an opera, or the tales of the genii.

Passing round the corner of the emperor's palace, one is admitted at a plain unornamented door in a corner. On my first visit, says Mr Swinburne, I confess I was struck with amazement, as I stept over the threshold, to find myself on a sudden transported into a species of fairy land. The first place you come to is the court called the *communa* or *del mesucar*, that is the *common baths*, an oblong square, with a deep bason of clear water in the middle; two flights of marble steps leading down to the bottom; on each side a parterre of flowers, and a row of orange-trees. Round the court runs a peristyle paved with marble; the arches bear upon very slight pillars, in proportions and style different from all the regular orders of architecture. The cielings and walls are incrustated with fret-work in stucco, so minute and intricate, that the most patient draughtsman would find it difficult to follow it, unless he made himself master of the general plan. This would facilitate the operation exceedingly; for all this work is frequently and regularly repeated at certain distances, and has been executed by means of square moulds applied successively, and the parts joined together with the utmost nicety. In every division are Arabic sentences of different lengths, most

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of

of them expressive of the following meanings: "There is no conqueror but God;" or, "Obedience and honour to our Lord Abouabdoula." The ceilings are gilt or painted, and time has caused no diminution in the freshness of their colours, though constantly exposed to the air. The lower part of the walls is mosaic, disposed in fantastic knots and festoons. A work so novel, so exquisitely finished, and so different from all that he had ever seen, must afford a stranger the most agreeable sensations while he treads this magic ground. The porches at the ends are more like grotto-work than any thing else to which they can be compared. That on the right hand opens into an octagon vault, under the emperor's palace, and forms a perfect whispering gallery, meant to be a communication between the offices of both houses.

Opposite to the door of the communa through which you enter, is another leading into the *quarto de los leones*, or apartment of the lions; which is an oblong court, 100 feet in length and 50 in breadth, environed with a colonnade 7 feet broad on the sides and 10 at the end. Two porticoes or cabinets about 15 feet square, project into the court at the two extremities. The square is paved with coloured tiles; the colonnade with white marble. The walls are covered five feet up from the ground with blue and yellow tiles, disposed chequerwise. Above and below is a border of small escutcheons, enamelled blue and gold, with an Arabic motto on a bend; signifying, "No conqueror but God." The columns that support the roof and gallery are of white marble, very slender, and fantastically adorned. They are 9 feet high, including base and capital, and $8\frac{1}{2}$ inches diameter. They are very irregularly placed; sometimes singly, at others in groups of three, but more frequently two together. The width of the horse-shoe arches above them is four feet two inches for the large ones, and three for the smaller. The cieling of the portico is finished in a much finer and more complicated manner than that of the communa, and the stucco laid on the walls with inimitable delicacy; in the ceiling it is so artfully frosted and handled as to exceed belief. The capitals are of various designs, though each design is repeated several times in the circumference of the court, but not the least attention has been paid to placing them regularly or opposite to each other. Not the smallest representation of animal life can be discovered amidst the varieties of foliages, grotesques, and strange ornaments. About each arch is a large square of arabesques, surrounded with a rim of characters, that are generally quotations from the Koran. Over the pillars is another square of delightful filligree work. Higher up is a wooden rim, or kind of cornice, as much enriched with carving as the stucco that covers the part underneath. Over this projects a roof of red tiles, the only thing that disfigures this beautiful square. This ugly covering is modern, put on by order of Mr Wall, the late prime minister, who a few years ago gave the Alhambra a thorough repair. In Moorish times, the building was covered with large painted and glazed tiles, of which some few are still to be seen. In the centre of the court are twelve ill-made lions muzzled, their fore parts smooth, their hind parts rough, which bear upon their backs an enormous bason, out of which a lesser rises. While the pipes were kept in good order, a great volume of water was thrown up, that falling down into the basons, passed through the beasts, and issued out of their mouths into a large reservoir, where it communicated by channels with the jet d'eaus in the apartments. This fountain is of white marble, embellished with many festoons and Arabic distichs, thus translated:

"Seest thou not how the water flows copiously like the Nile?"

"This resembles a sea washing over its shores, threatening shipwreck to the mariner."

"This water runs abundantly, to give drink to the lions."

"Terrible as the lion is our king in the day of battle.

"The Nile gives glory to the king, and the lofty mountains proclaim it."

"This garden is fertile in delights: God takes care that no noxious animal shall approach it."

"The fair princess that walks in this garden, covered with pearls, augments its beauty so much, that thou may'st doubt whether it be a fountain that flows, or the tears of her admirers."

Passing along the colonnade, and keeping on the south side, you come to a circular room used by the men as a place for drinking coffee and sorbets in. A fountain in the middle refreshes the apartment in summer. The form of this hall, the elegance of its cupola, the cheerful distribution of light from above, and the exquisite manner in which the stucco is designed, painted, and finished, exceed all powers of description. Every thing in it inspires the most pleasing, voluptuous ideas; yet in this sweet retreat they pretend that Abouabdoulah assembled the Abencerrages, and caused their heads to be struck off into the fountain. Continuing your walk round, you are next brought to a couple of rooms at the head of the court, which are supposed to have been tribunals, or audience-chambers.

Opposite to the *Sala de los Abencerrages* is the entrance into the *Terra de las dos hermanas*, or the tower of the two sisters; so named from two very beautiful pieces of marble laid as flags in the pavement. This gate exceeds all the rest in profusion of ornaments, and in beauty of prospect which it affords through a range of apartments, where a multitude of arches terminate in a large window open to the country. In a gleam of sunshine, the variety of tints and lights thrown upon this enfilade are uncommonly rich. The first hall is the concert room, where the women sat; the musicians played above in four balconies. In the middle is a jet d'eau. The marble pavement is equal to the finest existing, for the size of the flags and evenness of the colour. The two sisters, which give name to the room, are slobs that measure 15 feet by $7\frac{1}{2}$, without flaw or stain. The walls, up to a certain height, are mosaic, and above are divided into very neat compartments of stucco, all of one design, which is also followed in many of the adjacent halls and galleries. The ceiling is a fretted cove. To preserve this vaulted roof, as well as some of the other principal cupolas, the outward walls of the towers are raised 10 feet above the top of the dome, and support another roof over all, by which means no damage can ever be caused by wet weather or excessive heat and cold. From this hall you pass round the little myrtle-garden

Alambra.

of Lindaraxa, into an additional building made to the east end by Charles V. The rooms are small and low. His dear motto, *Plus ultra*, appears on every beam. This leads to a little tower, projecting from the line of the north wall, called *El tocador*, or the dressing room of the sultana. It is a small square cabinet, in the middle of an open gallery, from which it receives light by a door and three windows. The look-out is charming. In one corner is a large marble flag, drilled full of holes, through which the smoke of perfumes ascended from furnaces below; and here it is presumed, the Moorish queen was wont to sit to fumigate and sweeten her person. The emperor caused this pretty room to be painted with representations of his wars, and a great variety of grotesques, which appear to be copies, or at least imitations, of those in the loggie of the Vatican. From hence you go through a long passage to the hall of ambassadors, which is magnificently decorated with innumerable varieties of mosaics, and the mottos of all the kings of Granada. This long narrow antichamber opens into the communa on the left hand, and on the right into the great audience-hall in the tower of Comares; a noble apartment, 36 feet square, 36 high up to the cornice, and 18 from thence unto the centre of the cupola. The walls on three sides are 15 feet thick, on the other 9; the lower range of windows 13 feet high. The whole wall is inlaid with mosaic of many colours, disposed in intricate knots, stars, and other figures. In every part various Arabic sentences are repeated.

Having thus completed the tower of the upper apartments, which are upon a level with the offices of the the new palace, you descend to the lower floor, which consisted of bedchambers and summer-rooms: the back stairs and passages, that facilitated the intercourse between them, are without number. The most remarkable room below is the king's bedchamber, which communicated by means of a gallery, with the upper story. The beds were placed in two alcoves, upon a raised pavement of blue and white-tiles; but as it was repaired by Philip V. who passed some time here, it cannot be said how it may have been in former times. A fountain played in the middle, to refresh the apartment in hot weather. Behind the alcoves are small doors, that conduct you to the royal baths. These consist of one small closet with marble cisterns for washing children, two rooms for grown up persons and vaults for boilers and furnaces that supplied the baths with water and the stoves with vapours. The troughs are formed of large slabs of white marble; the walls are beautified with party-coloured earthen ware; light is admitted by holes in the coved ceiling.

Hard by is a whispering gallery, and a kind of labyrinth, said to have been made for the reception of the women and children. One of the passages of communication is fenced off with a strong iron grate, and called *the prison of the sultana*; but it seems more probable that it was put up to prevent any body from climbing up into the women's quarter.

Under the council-room is a long slip, called *the king's study*; and adjoining to it are several vaults, said to be the place of burial of the royal family. In the year 1574, four sepulchres were opened; but as they contained nothing but bones and ashes, were immediately closed again.

Ali | Alicant.

The description of the Alhambra may be finished by observing how admirably every thing was planned and calculated for rendering this palace the most voluptuous of all retirements; what plentiful supplies of water were brought to refresh it in the hot months of summer; what a free circulation of air was contrived, by the judicious disposition of doors and windows; what shady gardens of aromatic trees; what noble views over the beautiful hills and fertile plains! No wonder the Moors regretted Granada; no wonder they still offer up prayers to God every Friday for the recovery of this city, which they esteem a terrestrial paradise. See Granada.

ALI, gives denomination to a sect, or division, among the Mahometans, who adhere to the right of succession of Ali the fourth caliph or successor of Mahomet, and to the reform of Mussulmanism introduced by him. The sectaries of Ali are more particularly called *Schiites*; and stand opposed to the *Sunnites*, or sect of Omar, who adhere to the law as left by Mahomet, Abubeker, and Omar. Ali was cousin of Mahomet, and son-in-law of that prophet, having married his daughter Fatimah. After Mahomet's death, great disputes arose about the succession. Many stood for Ali; but Abubeker was preferred, and elected the first kalif. Ali took his turn, after the death of Othman.—The Persians are the chief adherents to the sect of Ali, whom they hold to have been the legitimate successor of Mahomet, and Abubeker, an usurper. On the contray, the Turks are of the sect of Omar; and hold Ali in execration, having raised a furious civil war among the Mussulmans. The distinguishing badge of the followers of Ali is a red turban, which is worn by the Persians, who are hence called in derision, by the Turks, *Kisilbachi*, q. d. *red-heads*. Ali is reputed the author of several works, particularly a Centiloquium, in great esteem among the Arabs and Persians, part of which has been published in English by Mr Ockley.

ALJAMEIA is a name which the Moriscoes in Spain give to the language of the Spaniards. Among other articles agreed on by the junto, which was appointed by the emperor Charles V. in 1526, in favour of the Moriscoes, this was one, That the Moriscoes should no longer speak Algavareia, i. e. Moorish or Arabic; but should speak *Aljameia*, i. e. Spanish, as it was called by the Moors, and all their writings and contracts should be in that language.

ALIAS, in law, a second or farther writ issued from the courts of Westminster, after a *capias*, &c. sued out without effect.

ALIBI, in law, denotes the absence of the accused from the place where he is charged with having committed a crime; or his being *elsewhere*, as the word imports, at the time specified.

ALICANT, a large sea port town in the province of Valencia and territory of Segura. It is seated between the mountains and the sea, and has a castle deemed impregnable. The port is defended by three bastions furnished with artillery. To prevent the visits of the Algerine pirates, watch-towers were built to give notice of the approach of an enemy's ship. It was taken from the Moors in 1264. The castle was taken by the English in 1706; and held out a siege of two years before it was retaken by the French and Spaniards, and at last surrendered upon honourable terms, after part of the rock was blown up on which the castle stood, and the governor killed. The houses are high, and well built; and a very great trade is carried on here, particularly in wine and fruit. It is seated in the Mediterranean, on a bay of the same name, 37 miles north-east of Murcia, and 75 south of Valencia. W. Long. 0. 36. N. Lat. 38. 24.

ALICATA, a mountain of Sicily, near the valleys Mazara and Noto, upon which was situated (as is generally thought) the famous Dedalion, where the tyrant Phalaris kept his brazen bull.

ALICATA, a town of Sicily, remarkable for corn and good wine. It was plundered by the Turks in 1543; and is seated on a sort of peninsula near the sea, twenty-two miles S. E. of Girgenti. E. Long. 15. 20. N. Lat. 37. 11.

Alicata Chlamys, was a sort of vest with sleeves, worn by the Roman boys till the age of thirteen, at which time they put on the *prætexta*.

ALIEN, in law, implies a person born in a strange country not within the king's allegiance; in contradistinction to a denizen, or natural subject. The word is formed from the Latin *alius*, "another;" q. d. one born in another country. An alien is incapable of inheriting lands in Britain till naturalized by an act of parliament. No alien is intitled to vote at the election of members of parliament; nor can he enjoy any office, or be returned on any jury, unless where an alien is party in a cause, when the inquest is composed of an equal number of denizens and aliens. The reasons for establishing these laws were, that every man is presumed to bear faith and love to that prince and country where he recived protection during his infancy; and that one prince might not settle spies in another's country; but chiefly that the rents and revenues of the country might not be drawn to the subjects of another. Some have thought that the laws against aliens were introduced in the reign of Henry II. when a law was made at the parliament of Wallingford, for the expulsion of strangers, in order to drive away the Flemings and Picards introduced into the kingdom by the wars of king Stephen. Others have thought that the origin of this law was more ancient; and that it is an original branch of the feudal law: for by that law no man can purchase any lands but he must be obliged to do fealty to the lords of whom the lands are holden; so that an alien who owed a previous faith to another prince, could not take an oath of fidelity in another sovereign's dominions. Among the Romans, only the *Cives Romani* were esteemed freemen; but when their territories increased, all the Italians were made free, under the name of *Latins*, tho' they had not the privilege of wearing gold rings till the time of Justinian. Afterwards all born within the pale of the empire were considered as citizens.

Alien-Duty, an impost laid on all goods imported by aliens, over and above the customs paid for such goods imported by Americans, and on American bottoms.

Aliens-Duty in Britian is called *petty customs*, and *navigation-duty*.—Fish dried or salted, and cod-fish or herring not caught in British vessels and cured by British, pay a double *alien's duty*.—On what footing aliens are permitted to import foreign commodities into Great Britain, see DUTY.

Alien-Priories, a kind of inferior monasteries, formerly very numerous in England, and so called from their belonging to foreign abbeys.

ALIENATION, in law, denotes the act of making over a man's property in land, tenements, &c. to another person.

ALIENATION in mortmain, is making over lands, tenements, &c. to a body-politic, or to a religious house, for which the king's licence must first be obtained, otherwise the lands, &c. alienated will be forfeited.

Alienation in fee, is the selling the fee-simple of any land, or other incorporeal right. All persons who have a right to lands may generally alien them to others; but some alienations are prohibited: such as alienations by tenants for life, &c. whereby they incur a forfeiture of their estate. By the statute of Edward I. a bar was put to alienations by what we call *entails*, which is an expedient for procuring perpetuities in families; but counter expedients were devised to defeat this intent, and a practice was introduced of cutting off entails by fines, and of barring remainders and reversions by recoveries. The statute for alienations in Henry VII's time had a great effect on the constitution of England; as, among other regulations of that reign, it tended to throw the balance of power more into the hands of the people. By the stat. 12 Car. II. cap. 24. fines for alienations are taken away. Crown lands are only alienable under a faculty of perpetual redemption. The council of Lateran, held in 1123, forbids any clerk to alienate his benefice, prebend, or the like. By the laws of the ancient Jews, lands could only be alienated for the space of 50 years. At each return of the jubilee all returned again to the primitive owners, or their descendants, to whom the lands were originally allotted at the first distribution of Canaan.

Alienation-Office, is an office to which all writs of covenants and entry, upon which fines are levied, and recoveries suffered, are carried, to have fines for alienation set and paid thereon.

ALIMENT, (from *alo* to nourish), implies food both solid and liquid: from which, by the process of digestion, is prepared a very mild, sweet, and whitish liquor resembling milk, and distinguished by the name of chyle; which being absorbed by the lacteal veins, by them conveyed into the circulation, and there assimilated into the nature of blood, affords that supply of nutrition which the continual waste of the body is found to require.—Next to air, food is the most necessary thing for the preservation of our bodies: and as on the choice thereof our health greatly depends, it is of great importance to understand in general, what is the properest for our nourishment; and in particular deviations from health, what is the best adapted to restore us. Our blood and juices naturally incline to become putrid and acrimonious: fresh chyle, duly received, prevent this destructive tendency, and preserves them in that mild state which alone consists with health. An animal diet affords the most of this bland nutritious mucilage: watery fluids dilute the too gross parts, and carry off what is become unfit for use. It is only the small portion of jelly which is separated from the farinaceous parts of vegetables, that, after being much elaborated, is converted into the animal nature; yet the use of vegetables prevents both repletion and a too great tendency to a putrescent acrimony of the blood. In hot climates, as well as against the constitutional heat of particular persons, vegetables are demanded in the largest proportion; animal substances afford the highest relish while our appetite continues; but will sate the appetite before the stomach is duly filled. Vegetables may be eaten after either flesh or fish: few herbs or fruits satiate so much as that the stomach may not be filled with them, when it is already satisfied with flesh or fish; whence it may be observed, that no diet which is very nourishig can be eat to fulness, because its nutritious parts are oily and satiating.—Health depends almost wholly on a proper crasis of the blood; and to preserve this a mixture of vegetables in some degree is always required, for a loathing is soon the consequence of animal food alone: hot acrid habits, too, receive from milk and vegetables what is needful for correcting their excesses; but in cold, pituitous, and nervous habits, who want most nourishment from least digestion, and from the smallest quantity of food, animal diet is to be used more freely.

Thus much being offered as general principles with respect to the matter and quality of our aliment, the valetudinarian may easily regulate his diet with some advantage to himself by an attention to the few ensuing particulars. In winter, eat freely, but drink sparingly: roast meat is to be preferred, and what is drank should be stronger than at other seasons. In summer, let thirst determine the quantity to be drunk; cold stomachs never require much: boiled meats and vegetables, if not otherwise contradicted, may now be more freely used. Lax habits require the winter's diet to be continued all the year, and rigid ones should be confined to that of summer. Fat people should fast at times, but the lean should never do so. Those who are troubled with eructations occasioned by their food, should drink but little, and use some unaccustomed exercise. The thirsty should drink freely, but eat sparingly. In general, let moderation be observed; and tho' no dinner hath been had, a light supper is at all times to be preferred. After very high-seasoned meats, a glass of water acidulated with the acid elixir of vitriol, or in very weak stomachs the sweet elixir of vitriol, is far more assistant to the work of digestion than the common method of taking brandy. See further FOOD and DRINK.

Obligation of ALIMENT, in Scots law, the natural obligation on parents to provide their children with the necessaries of life, &c. See LAW, Part III. N° clxxiii. 4.

ALIMENTARII *Pueri*, &c. were certain children maintained and educated by the munificence of the emperors, in a sort of public places, not unlike our hospitals. —Trajan was the first that brought up any of these *alimentary* boys. He was imitated by Adrian. Antoninus Pius did the same for a number of maids, at the solicitation of Faustina; and hence, in some medals of that empress, we read PVELLAE FAVSTINIANAE. —Alexander Severus did the like at the request of Mammæa; and the maids thus educated were called Mammæanæ.

ALIMENTARY *Duct* or *Canal*, is a name given by Dr Tyson and some others to that part of the body thro' which the food passes, from its reception into the mouth to its exit at the *anus*; including the *gula*, stomach, and intestines. See ANATOMY.

This duct has been said to be the true characteristic of an animal, or (in the jargon of the schools) *in proprium quarto modo*; there being no animal without it, and whatever has it being properly enough ranged under the class of animals. Plants receive their nourishment by the numerous fibres of their roots, but have no common receptacle for digesting the food received, or for carrying off the recrements. But in all, even the lowest degree of animal life, we may observe a stomach and intestines, even where we cannot perceive the least formation of any organ of the senses, unless that common one of feeling as in oysters. Phil. Trans. N° 269, p. 776, seq.

Dr Wallis brings an argument from the structure of the alimentary tube in man, to prove that he is not naturally carnivorous; to which Dr Tyson makes some objections. V. Phil. Trans. N° 269, p. 777.

ALIMENTARY *Law*, *lex alimentaria*, was an old law among the Romans, whereby children were obliged to find sustenance for their parents.

ALIMONY, in law, implies that allowance which a married woman sues for, and is intitled to, upon any occasional separation from her husband. See LAW, Part III. N° clx. 13.

ALIPILARIUS, or ALIPILUS, in Roman antiquity, a servant belonging to the baths, whose business it was, by means of waxen plasters, and an instrument called *volsella*, to take off the hairs from the arm-pits, and even arms, legs, &c. this being deemed a point of cleanliness.

ALIPTERIUM, αλειπτηριον, in antiquity, a place in the ancient *palestræ*, where the *athletæ* were anointed before their exercises.

ALIQUANT PART, in arithmetic, is that number which cannot measure any other exactly without some remainder. Thus 7 is an aliquant part of 16; for twice 7 wants two of 16, and three times 7 exceeds 16 by 5.

ALIQUOT PART, is that part of a number or quantity which will exactly measure it without any remainder. Thus 2 is an aliquot part of 4; 3 of 9; 4 of 16, &c.

ALISANDERS, or ALEXANDERS, in botany. See SMYRNIUM.

ALISMA, or WATER-PLANTAIN: A genus of the polygynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 5th order, *Tetrapetaloideæ*. The characters are: The *calyx* is a three-leaved perianthium: The *corolla* consists of three roundish, large, flat, expanding petals: The *stamina* consist of six subulated filaments shorter than the corolla; the antheræ are roundish: The *pistillum* consists of more than five germina; the styli are simple, the stigmata obtuse: The *pericarpium* consists of compressed capsulæ: The *seeds* are small and solitary. Of this genus there are eight

Species, viz. The plantago, or great water-plaintain which grows in all the marshy parts of Britain; the ranunculoides, or lesser water-plantain; the natans or creeping water-plantain; the damasonium, or starheaded water-plantain; all which are natives of Britain. The others, *viz.* the flava, cordifolia, subulata, and parnassifolia, are natives of America, where they are generally found in stagnating waters, and other swampy places; so that it would be difficult to preserve them in Britain, for they will not live in the

Alisontia open air, and they require a bog to make them thrive: but as they are plants of no great beauty or use, it is scarcely worth while to cultivate them.

Alkali.

ALISONTIA, or ALISUNTIA, (anc. geog.); a river of Belgic Gaul, now *Alsitz*; which rising on the borders of Lorrain, and running through the duchy, waters the city of Luxemburg, and, swelled by other rivulets, falls into the Sur.

ALITES, in Roman antiquity, a designation given to such birds as afforded matter of auguries by their flight.

ALKADARII, a sect among the Mahometans who deny any eternal, fixed, divine decrees, and are asserters of free will. The word is formed from the Arabic *alkadar*, which signifies "decree." The Alkadarii are a branch of Motazalites, and stand opposed to the Algiabarii. See ALGIABARII.

ALKAHEST, or ALCAHEST, in chemistry, an universal menstruum capable of resolving all bodies into their first principles. Van Helmont pretended he was possessed of such a menstruum; but, however credulous people might be imposed on in his days, the notion is now become as ridiculous as the philosopher's stone, the perpetuum mobile, &c.—It is likewise used by some authors for all fixed salts volatilized.

ALKALI, in chemistry, one of the general divisions of salts, comprehending that class of chemical elements which, by their union with acids, form *perfect neutrals*, in opposition to the salts formed of acids with metals or earths, which are called *imperfect*.

Alkaline salts are divided into two kinds, the fixed and volatile; and the former into two species, vegetable, and mineral or fossil. All of these possess some properties in common, and some peculiar to each.

1 Properties common to all the alkaline salts.

Those which they have in common are, 1. An acrid and pungent taste, which, when the salts are very pure and strong, degenerates into absolute causticity, and would entirely destroy the organ of sensation if long applied to it. 2. A tendency to dissolve animal substances, and reduce them to a gelatinous substance, which all of them will do when very strong. 3. An attraction for acids, with a power of separating earths and metals from them, though previously combined with the same. 4. They change the blue vegetable juices to green; the green to yellow; the yellow to orange; the orange to red; and the red to purple. 5. They unite with oils, and destroy or cause to fade almost all kinds of colours that can be put upon cloth, whence their use in bleaching, &c.

2 Properties common to the two fixed alkalis.

The properties common to both kinds of fixed alkalis are, 1. They resist the action of fire to a great degree, so that they can easily be reduced to a solid form by evaporating any liquid in which they happen to be dissolved. 2. By an intense fire, they flow into a liquid which concretes into an hard and solid mass in the cold. 3. When mixed in certain proportions with those earths or stones called *vitrifiable*, they melt, in a heat still more intense, into glass. 5. Mixed with ammoniacal salts, with animal substances, or with soot, they extricate a volatile alkali.

3 Of the volatile alkali.

The volatile alkali differs from the other two in being unable to resist the fire, and being entirely resolvable into an invisible and permanently elastic fluid, called by Dr Priestley *alkaline air*. In consequence of this volatility, it always affects the olfactory nerves very perceptibly, and its smell is the general criterion by which its strength may be judged of. Its attraction for acids, power of changing colours, &c. are also considerably weaker than those of the fixed alkalis.

Though two sorts of volatile alkali are commonly sold under the names of spirits of hartshorn and of sal ammoniac, the one differs from the other only in its degree of purity. The former is so called from its being originally made from the horns of deer; but this material has long been laid aside, and the bones of horses, the *flints*, as they are called, of the horns of cattle, the parings of hoofs, &c. have been substituted in their stead. This kind, however carefully prepared always contains a portion of animal oil, the smell of which is very perceptible; the other, prepared from pure sal ammoniac, is totally free of any empyreumatic smell, and is as pure as it can be obtained by any means whatever.

4 Effervescence with acids not a characteristic of alkali.

Effervescence with acids was formerly supposed to be a distinguishing property of alkalis, though it was always known that by a mixture with quicklime they might be deprived of this property. Dr Black, however, has shown, that the effervescing with acids is no property of pure alkali, but is occasioned only by the escape of fixed air from it: of consequence, when quicklime is added, which attracts the whole or greatest part of the fixed air, no effervescence can be perceived. In the state in which the fixed alkalis are commonly met with, indeed, effervescence with acids may be said to be an essential property; but this is entirely owing to the cause just mentioned, *viz.* a quantity of fixed air, to which they are united during the process by which they were originally formed. The quantity of this air, however, is never so great as to saturate them entirely; on the contrary, their alkaline properties are always very perceptible, and they are commonly said to be in a *mild* state. But the truth is, that now they are in a kind of intermediate state between what may be called perfectly mild and perfectly caustic. In their perfectly mild state, they are united with such a large quantity of fixed air as entirely overpowers their alkaline properties; and therefore they are no more entitled to the name of alkalis in this state, than when combined with the marine, nitrous, or any other acid; in which case the compounds are called neutral salts. But it is a much more laborious and tedious process to saturate an alkali completely with fixed air than with any other acid; nor does it very easily retain the aerial acid after it has once been combined with it. Hence the caustic taste and properties of the alkali almost always predominate, and the salt contains a portion of pure and caustic alkali, to which alone its virtues are to be ascribed.

5 Preparation of the vegetable alkali.

Vegetable alkali is obtained in its greatest purity by deflagrating nitre with charcoal, provided we make use of no more of the latter than is barely sufficient to destroy the nitrous acid. It is, however, a very difficult matter to adjust this proportion with sufficient accuracy; for if we employ too much charcoal, the salt will be considerably phlogisticated; if too little, some part of the nitre will remain undecomposed. Burnt tartar therefore, purified by solution and filtration, may be looked upon as the best alkali we have. The common alkalis, or *ashes* as they are called, and said to be obtained from the ashes of vegetables, are always mix-

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ed with much phlogiſton, and ſometimes with lime, ſalt, or other heterogeneous matters; for which reaſon they are not to be employed in the nicer chemical experiments, without being purified by ſolution in water, by filtration, and cryſtallization. The pureſt of all theſe ſalts is that called the *blue pearl*, imported from Hungary.

6
Its peculiar properties.

The vegetable alkali when thus purified, and containing near one half its weight of fixed air, is of a white colour when dry, with a very hot and cauſtic taſte, poſſeſſing in an eminent degree all thoſe qualities which have been aſcribed to the alkaline ſalts in general. It runs *per deliquium* when expoſed to the air; and is uſually incapable of being cryſtallized, though it acquires this property after being employed in the rectification of ardent ſpirit. It adheres more cloſely to acids than any ſubſtance hitherto diſcovered; though, from ſome experiments, Bergman was induced to believe that pure terra ponderoſa attracted acids ſtill more powerfully. But this has been diſcovered to be a miſtake by Dr Withering, who, in a paper publiſhed in the 74th volume of the Philoſophical Tranſactions, ſhows, that unleſs where the earth is united with vitriolic acid, not only the vegetable, the foſſil, but even the volatile alkali in its pure or cauſtic ſtate, will ſeparate it from any other with which it may be combined. Terra ponderoſa, therefore, will always decompoſe vitriolated tartar, Glauber's ſalt, or vitriolic ammoniac; whence the miſtake of this celebrated chemiſt probably has proceeded. After this alkali has been once united with marine acid, it appears to have undergone ſome change; for the ſalt then produced, by combining it with the vitriolic acid, reſembles Glauber's ſalt almoſt as much as it does vitriolated tartar. It ſeems therefore to have made ſome approach towards the nature of foſſil alkali; but chemiſts have not inquired what would be the conſequence of repeated combinations of this kind.

7
Of the foſſil alkali.

The foſſil alkali differs from the vegetable in having a ſmaller attraction for acids, in being more eaſily fuſible by itſelf, and forming a more ſoluble compound with the vitriolic acid. It is alſo eaſily cryſtallizable, even without the addition of more fixed air than it naturally contains: and experience has determined it to be more proper for glaſs or ſoap manufactures than the vegetable alkali; for which reaſon the demand for it is very conſiderable.

8
This alkali known to the ancients.

The foſſil alkali was anciently called *natron* or *nitre*, and is ſpoken of by Pliny and Tacitus as an ingredient in glaſs, &c. and the ſcriptures inform us that it was uſed in baths. The knowledge of this ſalt was loſt in the general obſcuration of ſcience which took place on the decline of the Roman empire; nor do we find it mentioned till the time of the Hon. Robert Boyle; and, even ſince that time, though M. du Hamel gave an accurate account of it in a memoir for the year 1736, little farther notice was taken of it till very lately.

9
Found native in many parts of the world.

We are now certainly informed that the foſſil alkali is found native in many parts of the world, which never is the caſe with the vegetable alkali. The places where it abounds moſt are, Egypt, the country of Tripoli in Barbary, the peak of Teneriffe in one of the Canary iſlands, Hungary, ſeveral of the provinces of Ruſſia, ſome parts of Aſia, particularly the neighbourhood of Smyrna, &c. though it has not hitherto been found in any of the weſtern countries of Europe, excepting in the neighbourhood of volcanoes, or in mineral waters; and in theſe laſt only in very ſmall quantity.

10
Is the baſis of common ſalt.

The great ſource of the mineral alkali, however, and from whence it is not improbable that the places already mentioned have been ſupplied by ſome unknown natural operation, is the water of the ocean. Foſſil alkali is the natural baſis of ſea-ſalt; and could any method of readily procuring it from this ſalt be fallen upon, it would no doubt be a moſt valuable ſecret. Hitherto, however, all the methods uſed with any ſucceſs by the chemiſts may be reduced to two. 1. By mixing the nitrous acid with ſea-ſalt in a retort, in the proportion, according to Dr Vogel, of four of the acid to one of the ſalt, and diſtilling off the muriatic acid, or rather aqua regia, which will be produced in the proceſs. The reſiduum will afford a cubical nitre by cryſtallization, from whence the alkali may be obtained pure by deflagrating with charcoal. 2. By addition of vitriolic acid the ſpirit of ſea-ſalt will be expelled much more eaſily, and at a cheaper rate, than by the nitrous acid. The reſiduum affords Glauber's ſalt in great plenty: this being melted in a crucible with a ſufficient quantity of charcoal-duſt, forms a hepar ſulphuris; which being decompoſed by means of the vegetable acid, the latter may be deſtroyed by force of fire, and the alkali obtained in purity. For a further explanation of both theſe methods, ſee the article Chemistry, *Index*.

The demand in England for foſſil alkali is ſupplied from the aſhes of kali and other ſea plants, from which it is ſeparated in the ſame manner as the vegetable alkali from the aſhes of other plants. The pureſt kind of aſhes containing this ſalt is called *ſoda* or *barilla*, and is imported chiefly from foreign countries; that which is obtained from the ſea-weed growing on their own coaſts, and known by the name of *kelp*, is exceſſively impure, and ſcarce admits of being thoroughly analyſed according to the rules of chemiſtry.

11
Properties of both fixed alkalis when cauſtic.

Both theſe alkalis may be deprived of their fixed air, and thus rendered pure and cauſtic, by the addition of quicklime. In this ſtate the difference between them is much leſs perceptible than in any other, though the addition of fixed air, or any other acid, always ſhows that no eſſential change has taken place in either. In this highly cauſtic ſtate they deſtroy the parts of animals in a manner ſimilar to that of fire: whence they are called *potential* cauteries, as the former is called the *actual* cautery. M. Morveau informs us, that on digeſting a piece of beef in a ſolution of cauſtic vegetable alkali, the liquor ſoon became red, and the fleſh aſſumed the form of a ſemitranſparent jelly, in which, however, one could eaſily perceive the ramifications of the ſmalleſt fibre; and, after ſtanding ſome months, it emitted but very little ſmell. The vegetable alkali is commonly made uſe of as the material for the common cauſtic or *lapis infernalis* of the ſhops; for the preparation of which, ſee Chemistry, *Index*. Both alkalis attract moiſture from the air when reduced to a ſolid form in their cauſtic ſtate, though neither the foſſil alkali nor its combinations do ſo in any other caſe. In their cauſtic ſtate alſo they only unite with oils, or diſſolve in ſpirit of wine; which laſt they

they have been supposed to purify, though it is more than probable that they decompose and communicate disagreeable qualities to it.

12 Volatile alkali in its mild and caustic states.

The volatile alkali, when procured immediately by the distillation of any substance capable of yielding it, is obtained in a state similar to that in which the alkalis are usually met with, viz. half mild and half caustic. By exposing the liquid alkali to a great quantity of fixed air, we may at last have it perfectly mild and neutralised; in which state it appears as a white salt extremely volatile, though less so than the pure caustic alkali. It dissolves very readily in water; but unless some caustic spirit, or some lime or fixed alkali be added, in order to abstract part of the fixed air, it will scarcely exhibit the characteristic of volatile alkali, viz. a pungent and urinous smell. The addition of fixed air, however, makes very little difference with regard to the chemical combinations of this salt; for as fixed air has a very slender power of acidity, it is expelled by every other acid with the greatest ease, and the same combinations formed as though it had not been present. The only difference is, that when a mild alkali is added to an acid, a strong effervescence takes place by reason of the escape of the fixed air through the liquid, while with the caustic alkali the mixture is made quietly and without disturbance.

The various combinations of the alkaline salts with the different acids, and the neutral compounds thence resulting, are exhibited in the following table.

1. Vegetable fixed alkali combined with

Vitriolic acid	forms	Vitriolated tartar.
Nitrous acid		Nitre.
Marine acid		Sal digestivus.
Acetous acid		Terra foliata tartari.
Acid of tartar		Soluble tartar.
Acid of borax, Acid of phosphorus, Saccharine acid, &c.		Anomalous salts, whose properties have not been ascertained.
Aerial acid		Mild or aerated alkali.

2. Fossil or mineral fixed alkali combined with

Vitriolic acid	forms	Glauber's salt.
Nitrous acid		Cubical nitre.
Marine acid		Common salt.
Acetous acid		A salt resembling terra foliata tartari, but which does not deliquate.
Acid of tartar		Rochelle salt.
Acid of borax		Borax.
Acid of phosphorus, Saccharine acid, &c.		Unknown salts.
Aerial acid		Mild fossil alkali.

3. Volatile alkali combined with

Vitriolic acid	forms	Vitriolic ammoniac, or Glauber's secret sal ammoniac.
Nitrous acid		Nitrous ammoniac, or volatile nitre.
Marine acid		Common sal ammoniac
Acetous acid		Spiritus mindereri.

Volatile alkali combined with

Acid of tartar	forms	A salt whose properties have not been investigated; which shoots into fine long crystals, and does not deliquate in the air.
Acid of borax		An anomalous salt.
Acid of phosphorus		Microcosmic salt, or essential salt of urine.
Saccharine acid, &c.		Anomalous salts.
Aerial acid		Volatile sal ammoniac, or salt of hartshorn.

Besides their attraction for acids, the alkalis have also an attraction for oils, sulphur, and spirit of wine, in the moist way, when the salts are deprived of their fixed air; and in this, as well as the dry way, with several metals, and vitrifiable earths and stones, as has been already mentioned. 13 Attractions of the alkalis for vinous substances.

With oil the vegetable fixed alkali forms a soap, though less perfect than that made with the caustic mineral alkali. When combined with fixed air they scarcely unite with oils. Boiled with sulphur, or melted with it in their dry state, they unite into a very fetid compound called *hepar sulphuris*, which is soluble in water, but totally and very quickly decomposed by the contact of air. Vegetable alkali unites with iron, tin, and zinc; corrodes copper, and runs with it into a liquor of a deep blue colour, and joins with lead in fusion. It does not act upon gold in its metallic state; but if a sufficient quantity be added to a small solution of gold in aqua regia, the calx of the metal will be first precipitated and afterwards dissolved.

Vegetable alkalis a principal ingredient in the powders called *fluxes*, used for the fusion of metalline ores. It promotes the fusion of earths, and forms glass with the crystalline kind. It is soluble in an equal weight of distilled water; and, when exposed to the air, it soon attracts moisture from it and flows into a liquid. In its caustic state it dissolves in spirits of wine, and forms with it a red tincture called *Van Helmont's tincture of salt of tartar*, formerly used both as an internal and external remedy, but now fallen into disrepute.

Fossil alkali in its caustic state unites with oil into an harder soap than that made with vegetable alkali. With sulphur it forms a heaper sulphuris in the same manner as the vegetable alkali, and yields a tincture with spirit of wine, which dissolves part of the salt whilst hot, but lets it fall again in a crystalline form when cold. Gold, silver, or quicksilver, are not affected by a solution of this salt; but copper and tin are dissolved by it in the open air. It affects tin, lead, regulus of antimony, and cobalt, slightly; but acts powerfully upon zinc, and forms a kermes mineral with crude antimony. Copper, iron, bismuth, zinc, antimony, and regulus of cobalt, fused with two parts of fossil alkali, are almost entirely dissolved in a very strong heat; but tin, lead, and regulus of antimony, treated in the same manner, only suffer a partial solution.

All the alkalis are of considerable use in medicine, though

though the particular virtues of vegetable and fossil alkali have not hitherto been properly ascertained. It is probable, however, that there must be a considerable diversity in their operations on the human body, as the vegetable alkali shows itself so much more acrid and powerful than the fossil. As both of them unite immediately with acids, and change them into mild neutral salts; hence, if any of the strong mineral acids should fall upon any part of the human body, and begin to corrode and give pain, the immediate application of the lixivium tartari, or of a solution of any of those alkaline salts in water, or of the salts themselves in powder, will destroy their causticity, and prevent their doing further mischief: Or if any of these acids should drop on clothes, linen, or other substances, and alkaline salts are immediately applied, they will neutralize the acid, and prevent its further corrosion: Or if a person should, through mistake, swallow any other corroding salt which an alkali will decompose, the taking down into the stomach solutions of the alkaline salts, or the salts themselves in proper doses, are the most likely means of affording relief, if not given too late (A).

14 Medical virtues of alkaline salts.

Both the vegetable and fossil alkali applied externally in a caustic state, first irritate and inflame the skin, and afterwards act as fire in mortifying and destroying it; and therefore have been much used by surgeons for opening buboes and other abscesses, and for eating away proud or fungous flesh that sprouts out from sores. Various formulæ of caustic alkalis have been employed for these purposes, of which an account is given under CHEMISTRY and PHARMACY.

The alkaline salts, when much diluted with water, have been used as washes for removing pimples from the face; but if such washes are continued long, they are apt to spoil the skin. The ancients often used to dissolve natron (the fossil alkali) in their baths, and esteemed such baths useful for removing itchings of the skin, the scab, the impetigo, leprosy, and almost all sorts of cutaneous eruptions; and they employed baths of the same kind for promoting sweat, and for curing various disorders. They mixed it likewise with turpentine, with oils, and with stuffs of various kinds, and rubbed or applied such compositions to the skin, for removing different complaints, to heal sores, to strengthen weak or relaxed parts, to destroy the poison of the bite of a mad dog, and of serpents; and they esteemed it as an antidote against many other poisons.

15 Do not act as antiseptics when taken into the human body.

It has been proved that alkaline salts preserve animal substances from putrefaction; on which account some practitioners have concluded that they act as strong antiseptic remedies when swallowed as medicines, and are taken up by the lacteal vessels, and by them carried to the subclavian vein to be mixed with the blood. Experience, however, has shown that they have effects directly opposite, and that by stimulating the vessels and quickening the circulation, they contribute towards the dissolution of the vital fluid; of which Dr Monro says he has seen several instances.

Alkalis promote the secretions in general particularly by the kidneys; but by the help of warm liquors and bed-clothes, their operation may be directed towards the skin. They have also been employed in cases of heartburn, and others where an acid prevails in the stomach and bowels, or where these organs are loaded with viscid phlegm. They are likewise given with a view to assist the operation of the bile when it is too weak and inert, either by themselves, or mixed with purgative or other medicines. The fossil alkali has been alleged to be a more powerful solvent of the human calculus than the vegetable, though perhaps without any just foundation. It is given from 5 to 20 grains three times a-day; and in some cases even to double that quantity. It may be taken in any common liquor, or in clear broth made of lean meat, from which the fat has been skimmed off; or the powdered salts may be made up into pills or boluses mixed with liquorice powder, by means of mucilage of gum Arabic or conserve.

16 Are of considerable use in dropsies.

The vegetable alkali has been long used as a diuretic in dropsies with great success; and Dr Monro informs us, that he has seen a number of cases of anasarca in which the water was carried off by it. As diuretics, it may be taken from ten grains to half a drachm, or more, two or three times a-day, mixed with some distilled water, syrup, broth, or water-gruel, or with two ounces of white wine, which partly neutralizes the salt. When added to infusions of juniper berries, broom tops, horse-radish, mustard-seed, winter's-bark, &c. in wine and beer, they prove powerful diuretics; and Dr Monro gives the following formula.

"Take broom-tops, horse-radish, and juniper-berries, of each an ounce; bruise them in a stone or marble mortar; put them into a large wide-mouthed bottle, and add to them an ounce of salt of tartar, and two quarts of Rhenish wine. Infuse them for four days; decant off the wine, and filter it through paper for use. Two or three ounces may be taken three or four times a-day."

Or, "Take an ounce of canella alba, and as much mustard-seed and juniper-berries; bruise them well in an iron mortar, and add an ounce of purified vegetable alkali with two quarts of porter; infuse for four days, and filter the liquor through paper; let the patient take a wine glass-full every four or six hours."

The diuretic powers of these medicines are sometimes increased by opium, and they have been successfully joined with essential oils and balsams.

17 An excellent solvent of the stone.

The most remarkable property of these salts, however, is that of dissolving the human calculus; for the discovery of which, Mrs Stephens, in the year 1740, obtained a parliamentary reward of 5000 l. At that time Dr Jurins being afflicted with the stone, tried a number of experiments on these medicines; from which he concluded, that their efficacy depended entirely on the

(A) With regard to the mineral acids, an exception seems to take place if oil of vitriol in its concentrated state should happen to be swallowed; for this contracts such a degree of heat on the contact of any aqueous fluid as would destroy the patient, independent of another cause. An instance we have seen where a person unhappily mistook a bottle of oil of vitriol for water in the night-time. He recovered by swallowing instantly a great quantity of milk. Another recovered by drinking a bottle of Florence oil.

the alkaline salts and lime which they contained: and therefore he began to try what effects a soap-ley would have on himself. At first he took only a few drops, but gradually increased his dose till he came to an ounce, and sometimes an ounce and a half, in a proper vehicle, in 24 hours. This produced the discharge of some small calculi, and relieved him of the symptoms of the stone. Dr Hartley, likewise, laboured under this complaint: and believing that the efficacy of Mrs Stephens's medicines depended on the soap, lime, and alkaline salts which they contained, ordered a paste to be prepared for himself, made of eight ounces of soap, one of oyster-shell lime, a drachm of salt of tartar, and as much water as formed the whole into a soft mass; of which he took large quantities, and found himself greatly relieved, though not cured, as a stone was found in his bladder after his death. These and other instances of success, soon brought the medicines into general use: but though many found relief from them, others, particularly those who were afflicted with the stone, had all the symptoms of their distemper aggravated, by the salts rendering the blood, and other liquors of the body, particularly the urine, sharp and acrid, so as to irritate and inflame the bladder, which was already in too irritable a state, from the constant friction of the calculus lodged within it. The late experiments of Mr Scheele and Sir Torbern Bergman, however, have made it evident, that the human calculus is composed of a concrete acid joined to a small portion of animal earth. Most people, therefore, who are afflicted with the stone or gravel, wish to try the efficacy of these remedies, rather than submit to the dangerous operation of lithotomy; we shall therefore subjoin, from Dr Monro, the following directions for making and using the soap-ley.

18
Monro's directions for making and using the soap-ley.

"Take of salt of tartar, eight ounces; of fresh quicklime, four ounces; of distilled water, a quart: mix them all well together in a large bottle, and let them stand for 24 hours; then pour off the ley and filter it through paper, keeping it in well-stopped vials for use. Of this the dose is from 30 drops to three or four drachms, which is to be repeated two or three times in the day.

"One of the best methods of taking this ley is, to mix the quantity to be used in the day with three pints of plain broth, which has been made with the lean part of veal, with all the fat or oily parts separated from it, by putting it, when made, into a large bowl, and skimming them off with a spoon when cold, and to drink, within an hour, a pint of this broth three times in the day—early in the morning—at noon—and in the evening; and to continue the use of this medicine for three four, or more months; and, during this course, to live on such things as least counteract the operation of the medicine: to take for breakfast some plain broth, such as has been described, with dry toasted bread or biscuit: or a dish or two of tea or coffee in place of the broth: for dinner to eat the lean part of plain boiled or roasted meat, or a fowl, with their own gravy or juice for sauce; and to eat only of vegetables which contain but little acid, such as potatoes, &c. and to use for drink toast and water, or water with a very small portion of spirit in it, and to abstain from eating fruit and acescent vegetables, fat meat, butter, or oil; and from drinking wine, beer, cyder, punch, and in short from taking any thing which is likely to counteract or destroy the effects of the ley."

With regard to the use of the soap-ley, our author observes, "that he has seen a number of people who have taken it, both for gravellish complaints and for the stone; that many of those who had gravel were relieved, and some of them seemed to be cured; that some few of those who had the confirmed stone, received considerable relief for a time from its use: but the complaints afterwards returned; nor can he say that one complete cure was made; though from the accounts given by the late Dr Whytt of Edinburgh, and others, it should appear that this had sometimes happened: that in many cases of stone the ley occasioned pain and irritation, and increased the violence of the symptoms so much, that the patients were obliged to lay it aside; and that this happened most frequently where the bladder seemed already to be diseased from the irritation of the stone: that at all times it is advisable to lay aside this medicine, at least for a time, whenever it irritates and occasions pain, or where there are appearances of its continued use having broken down the crasis of the blood.

19
Aerated vegetable alkali recommended.

Instead of the soap-ley, the following solution of vegetable alkali, fully saturated with fixed air, has been lately recommended as a powerful solvent of the stone. "Take two ounces of salt of tartar, and dissolve it in two quarts of distilled water, and then saturate it fully with fixed air; and let the patient take eight ounces of it every eight hours. But though many cases have been related in which this medicine is said to have been serviceable, our author says he has seen only one gentleman who had taken it, and who had found considerable relief from it. Soap-ley has likewise been recommended as a solvent of bilious calculi, and has sometimes been of service; but this has probably arisen more from its property of dissolving thick and viscid humours, and assisting the action of the bile, than by acting on the calculi themselves.

20
Medical virtues of the volatile alkali.

The volatile alkali has many of the virtues of the fixed, but affects animal substances, particularly in its caustic state, less powerfully than they do. It gives a brisk and strong stimulus to the nerves and fibres of living animals; and is therefore employed in diseases where the pulse is low and the circulation too languid; in low fevers, where the patient is in danger of sinking; in apoplectic and lethargic disorders of elderly people of phlegmatic habits, in paralytic cases, fainting fits, &c. where a brisk and stimulating remedy is wanted. It is often used as diaphoretic and sudorific in cases of rheumatism, in the end of fevers, catarrhs, and other diseases, where a plentiful diaphoresis or sweat is required; and, according to our author, it is principally owing to this quality that the alkalis have obtained their reputation of being efficacious remedies against the bites of serpents and other venomous animals. It is equally efficacious against mineral acid poisons with the fixed alkali.

21
Origin of alkaline salts.

It now remains only to give some account of the origin of the alkalis, or that process by which they are naturally produced. This subject, however, is very much involved in obscurity; nor has the origin of fixed alkalis, at least, been investigated with such diligence and success as that of the acids. Chemists have been divided in their opinions, whether alkaline salts be natural

Alkali.

tural bodies, or formed by the force of fire, uniting the principles of which they consist in the burning or distilling the substances from which they are got. It is generally supposed that they are formed by the force of fire intimately uniting an earth, an acid, and an inflammable matter together, so as to form an alkaline salt, which is supposed to be composed of these principles. In support of this opinion, it has been alleged, 1. That the fixed vegetable alkali is produced by burning vegetables which contain the principles fit for forming these salts; though no vestige of an alkali can be discovered in these vegetables in their natural state. 2. That the essential salts of vegetables, which contain an acid and an earth, on being calcined in a crucible with charcoal, yield an alkaline salt. 3. That by alternately allowing the vegetable alkali to run per deliquium, and drying it again, it precipitates a quantity of earth, every time it is dissolved; so that the whole of the salt is at last reduced to this kind of earth, while the acid, phlogiston, &c. have evaporated, or been destroyed by the repeated application of heat for drying the salt. 4. In like manner the volatile alkali is produced by distilling animal substances which contain the principles fit for producing it, though no marks of a volatile alkali could be discovered in these substances while they were fresh.

On the other hand, it has been asserted that the alkaline salts obtained by burning vegetables, or distilling animal substances, existed originally in the materials from which they are procured; that they were generated in the plants by the process of vegetation, and freed by the fire from the other principles which disguised them. In support of this opinion the following arguments are made use of by Messrs Weigleb, Rosenstiel, Morveau, &c. 1. That they had not been able to procure an alkaline salt by mixing earths, oil, and acids together, and subjecting them to the most intense fire. 2. The crystals of tartar, which were formerly believed to be pure acid salts, have been found by late experiments to contain a vegetable alkali. 3. The vegetable alkaline salt, when purified is always of the same nature, from whatever substance it is procured; and therefore must have been an original principle or body existing in the vegetables from which it is procured: for had it been produced by art, it would have varied, and we should have had different species of it, according to the principles which the plants contained. And, 4. The neutral salts which have been found mixed with the ashes of plants, as vitriolated tartar, nitre, and sea-salt, are likewise strong proofs of the original existence of alkali in vegetables.

On this subject Dr Monro observes, that hitherto we have not sufficient evidence to determine positively whether the vegetable alkali be produced by the force of fire, or if it existed originally in the substances from which it is prepared, though he is inclined to favour the former opinion. With regard to the volatile alkali, however, we have abundant evidence of its being produced from substances which could not possibly be supposed to contain it originally. Dr Stahl assures us, that if any dry fixed alkaline salt be well rubbed in a mortar with such a quantity of oil of turpentine, as is sufficient to make it of the consistence of a pulp, and digested for some weeks in a cucurbit or retort, we obtain a volatile alkali. Mr Geoffroy relates, that having placed a large retort in a sand furnace, and adapted a tubulated receiver to it, afterwards heating the bottom of the retort red-hot, he put into it, by means of a long tube rising from the upper part of the neck, a powder composed of equal parts of nitre and charcoal on which there came over into the receiver a liquor highly impregnated with volatile alkali. Cartheuser, in the first volume of his Materia Medica, tells us, that if two parts of salt of tartar be mixed with one of sulphur, and be afterwards distilled, they yield a volatile alkaline salt and spirit. Boerhaave and Macquer have both affirmed, that the vegetative process itself produces a volatile alkali; and that the juices got by bruising mustard-seed and other alkalescent vegetables, as they are called, contain a volatile alkali which effervesces with acids: but this is denied by Cartheuser and Vogel, who affirm that they could discover no traces of volatile alkali in their juices by any experiments they made.

Alkali | All-Saints.

But whatever may be concluded from the experience of former chemists, the late discoveries of Dr Priestley and Mr Cavendish have decisively shewn, that the volatile alkali is by no means a simple element or natural principle, but a compound, and which may be artificially prepared. Dr Priestley informs us, that by the union of nitrous air with iron, a volatile alkali is generated; and Mr Cavendish, that by the action of the electric fluid, or pure elementary fire, upon phlogisticated air, the nitrous acid is produced: the volatile alkali, therefore, must be supposed to consist ultimately of phlogisticated air united to a great quantity of elementary fire. In like manner, if we can suppose this subtile element to enter into the substance of any kind of earth in such a manner as to exert its peculiar action when that substance is applied to any other, we may reasonably conclude that the fixed alkalis also are not simple and permanent principles, but capable of artificial composition and decomposition. It is certain that the action of alkaline salts is extremely similar to that of fire; and as we know that this element is combined in a *latent* state with fluids, there can be no absurdity in supposing it capable of combining also with solids.

See Aerology, n° 149.

See Acid, n° 7.

ALKALI, or *Sal Kali*, in botany. See SALICORNIA.

ALKANET, in botany. See ANCHUSA.

ALKEKENGI, in botany, the trivial name of a species of physalis. See PHYSALIS.

ALKENNA, in botany. See LAWSONIA.

ALKERMES, in pharmacy, a compound cordial medicine made in the form of a confection, deriving its name from the kermes-berries used in its composition.

ALKORAN. See ALCORAN.

ALL-HALLOWS. See *ALL-Saints*.

ALL-Good. See CHENOPODIUM.

ALL-Heal. See HERACLEUM and STACHYS.

ALL-Saints, in the kalendar, denotes a festival celebrated on the first of November, in commemoration of all the saints in general; which is otherwise called *All-hallows*. The number of saints being so excessively multiplied, it was found too burdensome to dedicate a feast-day to each. In reality, there are not days enough, scarce hours enough, in the year, for this purpose. Hence an expedient was had recourse to, by commemorating such in the lump as had not their own days. Boniface IV. in the ninth century, introduced the

the feast of *All Saints* in Italy, which was soon after adopted into the other churches.

All-Saints Bay, a spacious harbour near St Salvador in Brazil, in S. America, on the Atlantic ocean. W. Long. 40°. S. Lat. 12°.

All-Souls, in the calendar, denotes a feast-day, held on the second of November, in commemoration of all the faithful deceased.—The feast of All-Souls was first introduced in the eleventh century, by Odilon abbot of Cluny, who enjoined it on his own order: but it was not long before it became adopted by the neighbouring churches.

ALL-SPICE. See MYRTUS and CALYCANTHUS.

ALLA, or ALLAH, the name by which the professors of Mahometanism call the Supreme Being.

The term *alla* is Arabic, derived from the verb *alah*, to adore. It is the same with the Hebrew *Eloah*, which signifies the *Adorable Being*.

ALLAMANDA, in botany; a genus of the monogynia order, belonging to the pentandria class of plants. The characters are: The *calyx* is a five-leav'd perianthium: The *corolla* consists of one funnel-shap'd petal; the tube cylindric; the border semiquinquefid and ventricose; the divisions expanding and obtuse: The *stamina* have scarce any filaments; the antheræ are five, arrow-shaped, converging, in the throat of the tube: The *pistillum* has an oval germen, girt at the base with an annular margin; the stylus is filiform, the length of the tube; the stigma is headed, and contracted in the middle: the *pericarpium* is an orbicular, compressed, bristly capsule, containing one cell with two valves: The *seeds* are imbricated, orbicular, flat, with a membranaceous wing on the margin, and are very numerous. There is but one species, the cathartica, a native of Surinam.

ALLANTOIS, or ALLANTOIDES, a gut-shaped vesicle investing the fœtus of cows, goats, sheep, &c. filled with an urinous liquor conveyed to it from the urachus.—(See *COMPARATIVE Anatomy*). Anatomists are not agreed whether the allantois has any existence in the human species or not.

ALLATIUS (Leo), keeper of the Vatican library, a native of Scio, and a celebrated writer of the 17th century. He was of great service to the gentlemen of Port Royal in the controversy they had with M. Claude touching the belief of the Greeks with regard to the eucharist. No Latin was ever more devoted to the see of Rome, or more inveterate against the Greek schismatics, than Allatius. He never engaged in matrimony, nor was he ever in orders; and pope Alexander VII. having asked him one day, why he did not enter into orders? he answered, "Because I would be free to marry." The pope rejoined, "If so, who do you not marry?" "Because," replied Allatius, "I would be at liberty to take orders." Thus, as Mr Bayle observes, he passed his whole life, wavering betwixt a parish and a wife; sorry, perhaps at his death, for having chosen neither of them; when, if he had fixed upon one, he might have repented his choice for 30 or 40 years.—If we believe John Patricius, Allatius had a very extraordinary pen, with which and no other, he wrote Greek for 40 years; and we need not be surprised, that, when he lost it, he was so grieved, that he could scarce forbear crying. He published several manuscripts; several translations of Greek authors, and several pieces of his own composing. In his compositions he is thought to show more erudition than judgment: he used also to make frequent digressions from one subject to another. He died at Rome in 1669, aged 83.

ALLAY. See ALLOY.

ALLEGATA, a word anciently subscribed at the bottom of rescripts and constitutions of the emperors; as *signata*, or *testata*, was under other instruments.

ALLEGEAS, or ALLEGIAS, a stuff manufactured in the East-Indies. There are two sorts of them: some are of cotton, and others of several kinds of herbs, which are spun like flax and hemp. Their length and breadth are of eight ells, by five, six, or seven-eighths, and of twelve ells, by three-fourths, or five-eighths.

ALLEGIANCE, in law, is the tie, or *ligamen*, which binds the subject to the government, in return for that protection which government affords the subject. The thing itself, or substantial part of it, is founded in reason and the nature of government; the name and the form are derived to us from ancient Gothic usage. Under the feudal system, every owner of land held them in subjection to some superior or lord, from whom or from whose ancestors the tenant or vassal had received them: and there was a mutual trust or confidence subsisting between the lord and vassal, that the lord should protect the vassal in the enjoyment of the territory he had granted him; and on the other hand, that the vassal should be faithful to the lord, and defend him against all his enemies. This obligation on the part of the vassal was called his *fidelitas* or fealty: and an oath of fealty was required by the feudal law to be taken by all tenants to their landlord, which is couched in almost the same terms as the ancient oath of allegiance; except that, in the usual oath of fealty, there was frequently a saving or exception of the faith due to a superior lord by name, under whom the landlord himself was perhaps only a tenant or vassal. But when the acknowledgment was made to the absolute superior himself, who was vassal to no man, it was no longer called the oath of fealty, but the oath of allegiance, and therein the tenant swore to bear faith to his sovereign lord, in opposition to all men, without any saving or exception. Land held by this exalted species of fealty, was called *feudum ligium*, a liege fee, the vassals *homines ligii*, or liege men; and the sovereign their *dominus ligius*, or liege lord. And when sovereign princes did homage to each other for lands held under their respective sovereignties, a distinction was always made between *simple* homage, which was only an acknowledgment of tenure, and *liege* homage, which included the fealty before-mentioned, and the services consequent upon it. In Britain, it becoming a settled principle of tenure, that all lands in the kingdom are holden of the king as their sovereign and lord paramount, no oath but that of fealty could ever be taken to inferior lords; and the oath of allegiance was necessarily confined to the person of the king alone. By an easy analogy, the term *allegiance* was soon brought to signify all other engagements which are due from subjects to their prince, as well as those duties which were simply and merely territorial. And the oath of allegiance, as administered in England for upwards of 600 years, contained a promise "to be true and faithful to the king and his heirs, and truth and faith to bear of life and limb and terrene honour, and not to

Allegiance "know or hear of any ill or damage intended him, "without defending him therefrom." But, at the revolution, the terms of this oath being thought perhaps to favour too much the notion of non-resistance, the present form was introduced by the convention parliament, which is more general and indeterminate than the former; the subject only promising "that he will "be faithful and bear *true* allegiance to the king." without mentioning "his heirs," or specifying in the least wherein that allegiance consists. The oath of supremacy is principally calculated as a renunciation of the pope's pretended authority: and the oath of abjuration, introduced in the reign of King William, very amply supplies the loose and general texture of the oath of allegiance; it recognizing the right of his majesty, derived under the act of settlement; engaging to support him to the utmost of the juror's power; promising to disclose all traiterous conspiracies against him; and expressly renouncing any claim of the descendants of the late pretender, in as clear and explicit terms as the English language can furnish. This oath must be taken by all persons in any office, trust, or employment; and may be tendered by two justices of the peace to any person whom they shall suspect of disaffection. And the oath of allegiance may be tendered to all persons above the age of twelve years, whether natives, denizens, or aliens.

Blackstone's Comment.

But, besides these *express* engagements, the law also holds that there is an *implied*, *original*, and *virtual* allegiance, owing from every subject to his sovereign, antecedently to any express promise, and although the subject never swore any faith or allegiance in form. Thus Sir Edward Coke very justly observes, that "all subjects are equally bounden to their allegiance as if they had taken the oath; because it is written by the finger of the law in their hearts, and the taking of the corporal oath is but an outward declaration of the same."

Allegiance, both express and implied, is however distinguished by the law into two sorts or species, the one *natural*, the other *local*; the former being also perpetual, the latter temporary.

Natural allegiance is such as is due from all men born within the king's dominions immediately upon their birth. For immediately upon their birth, they are under the king's protection; at a time too, when (during their infancy) they are incapable of protecting themselves. Natural allegiance is, therefore, a debt of gratitude; which cannot be forfeited, cancelled, or altered, by any change of time, place, or circumstance, nor by any thing but the united concurrence of the legislature. A Briton who removes to France, or to China, owes the same allegiance to the king of Britain there as at home, and twenty years hence as well as now. For it is a principle of universal law, That the natural-born subject of one prince cannot by any act of his own, no, not by swearing allegiance to another, put off or discharge his natural allegiance to the former: for this natural allegiance was intrinsic, and primitive, and antecedent to the other; and cannot be divested without the concurrent act of that prince to whom it was first due.

Local allegiance is such as is due from an alien, or stranger born, for so long time as he continues within the king's dominion and protection; and it ceases the instant such stranger transfers himself from one kingdom to another. Natural allegiance is therefore *perpetual*, and local *temporary* only; and that for this reason, evidently founded upon the nature of government, That allegiance is a debt due from the subject, upon an implied contract with the prince; that so long as the one affords protection, so long the other will demean himself faithfully. Allegory.

The *oath* of allegiance, or rather the *allegiance* itself, is held to be applicable, not only to the political capacity of the king, or regal office, but to his natural person and blood-royal: and for the misapplication of their allegiance, viz. to the regal capacity or crown, exclusive of the person of the king, were the Spencers banished in the reign of Edward II. And from hence arose that principle of personal attachment and affectionate loyalty, which induced Englishmen in former times (and if occasion required, would doubtless induce their sons) to hazard all that was dear to them, life, fortune, and family, in defence and support of their liege lord and sovereign.

Paley's Moral and Political Philosophy. Philad. Ed. p. 142.

It is to be observed, however, in explanation of this allegiance, That it does not preclude resistance to the king, when his misconduct or weakness is such as to make resistance beneficial to the community. It seems fairly presumeable, that the convention parliament, which introduced the oath of allegiance in its present form, did not intend to exclude all resistance; since the very authority by which the members sat together, was itself the effect of a successful opposition to an acknowledged sovereign.

Again: The allegiance above described can only be understood to signify obedience to lawful commands. If, therefore, the king should issue a proclamation, levying money or imposing any service or restraint upon the subject, beyond what the law authorised, there would exist no sort of obligation to obey such a proclamation, in consequence of having taken the oath of allegiance.

Neither can allegiance be supposed to extend to the king after he is actually and absolutely deposed, driven into exile, or otherwise rendered incapable of exercising the regal office. The promise of allegiance implies, that the person to whom the promise is made continues king: that is, continues to exercise the power, and afford the protection, which belong to the office of king: for it is the possession of these which makes such a particular person the object of the oath.

ALLEGORY, in composition, consists in choosing a secondary subject, having all its properties and circumstances resembling those of the principal subject, and describing the former in such a manner as to represent the latter. The principal subject is thus kept out of view, and we are left to discover it by reflection. In other words, an allegory is, in every respect, similar to an hieroglyphical painting, excepting only that words are used instead of colours. Their effects are precisely the same: An hieroglyphic raises two images in the mind; one seen, that represents one that is not seen: An allegory does the same; the representative subject is described, and the resemblance leads us to apply the description to the subject represented.

There cannot be a finer or more correct allegory than the following, in which a vineyard is made to represent God's own people the Jews:

"Thou hast brought a vine out of Egypt; thou "hast cast out the heathen, and planted it. Thou didst "cause it to take deep root, and it filled the land. The "hills were covered with its shadow, and the boughs "thereof were like the goodly cedars. Why hast thou "then broken down her hedges, so that all that pass "do pluck her? The boar out of the wood doth waste "it, and the wild beast doth devour it. Return, we "beseech thee, O God of hosts: look down from hea-"ven, and behold, and visit this vine and the vineyard "thy right-hand hath planted, and the branch thou "madest strong for thyself." Psal. lxxx.

Nothing gives greater pleasure than an allegory, when the representative subject bears a strong analogy, in all its circumstances, to that which is represented. But most writers are unlucky in their choice, the analogy being generally so faint and obscure, as rather to puzzle then to please. Allegories, as well as metaphors and similies, are unnatural in expressing any severe passion which totally occupies the mind. For this reason, the following speech of Macbeth is justly condemned by the learned author of the Elements of Criticism:

Methought I heard a voice cry, Sleep no more!
Macbeth doth murder Sleep; the innocent sleep;
Sleep that knits up the ravell'd sleeve of Care,
The birth of each day's life, sore labour's bath,
Balm of hurt minds, great Nature's second course,
Chief nourisher in life's feast. Act ii. Sc. 3.

But see this subject more fully treated under the article Metaphor *and Allegory*.

ALLEGRI (Antonio), called *Corregio* from the place of his birth, an eminent historical painter, was born in the year 1494. Being descended of poor parents, and educated in an obscure village, he enjoyed none of those advantages which contributed to form the other great painters of that illustrious age. He saw none of the statues of ancient Greece or Rome; nor any of the works of the established schools of Rome and Venice. But Nature was his guide; and Corregio was one of her favourite pupils. To express the facility with which he painted, he used to say that he always had his thoughts ready at the end of his pencil.

The agreeable smile, and the profusion of graces which he gave to his madonas, saints, and children, have been taxed with being sometimes unnatural; but still they are amiable and seducing: An easy and flowing pencil, an union and harmony of colours, and a perfect intelligence of light and shade, gave an astonishing relief to all his pictures, and have been the admiration both of his cotemporaries and his successors. Annibal Caracci, who flourished 50 years after him, studied and adopted his manner n preference to that of any other master. In a letter to his cousin Louis, he expresses with great warmth the impression which was made on him by the first sight of Corregio's paintings: "Every thing which I see here (says he) astonishes me; particularly the colouring and the beauty of the children. They live—they breathe—They smile with so much grace and so much reality, that it is impossible to refrain from smiling and partaking of their enjoyment. My heart is ready to break with grief when I think on the unhappy fate of poor Corregio—that so wonderful a man (if he ought not rather to be called an angel) should finish his days so miserably, in a country where his talents were never known!"

From want of curiosity or of resolution, or from want of patronage, Corregio never visited Rome, but remained his whole life at Parma, where the art of painting was little esteemed, and of consequence poorly rewarded. This concurrence of unfavourable circumstances occasioned at last his premature death at the age of 40. He was employed to paint the cupola of the cathedral at Parma, the subject of which is an assumption of the Virgin; and having executed it in a manner that has long been the admiration of every person of good taste, for the grandeur of design, and especially for the boldness of the fore-shortenings (an art which he first and at once brought to the utmost perfection), he went to receive his payment. The canons of the church, either through ignorance or baseness, found fault with his work; and although the price originally agreed upon had been very moderate, they alledged that it was far above the merit of the artist, and forced him to accept of the paultry sum of 200 livres; which, to add to the indignity, they paid him in copper money. To carry home this unworthy load to his indigent wife and children, poor Corregio had to travel six or eight miles from Parma. The weight of his burden, the heat of the weather, and his chagrin at this villanous treatment, immediately threw him into a pleurisy, which in three days put an end to his life and his misfortunes.

For the preservation of this magnificent work the world is indebted to Titian. As he passed through Parma, in the *suite* of Charles V. he run instantly to see the *chef d'œuvre* of Corregio. While he was attentively viewing it, one of the principal canons of the church told him that such a grotesque performance did not merit his notice, and that they intended soon to have the whole defaced. "Have a care of what you do (replied the other), if I were not Titian, I would certainly wish to be Corregio."

Corregio's exclamation upon viewing a picture by Raphael is well known. Having long been accustomed to hear the most unbounded applause bestowed on the works of that divine painter, he by degrees became less desirous than afraid of seeing any of them. One, however, he at last had occasion to see. He examined it attentively for some minutes in profound silence; and then with an air of satisfaction exclaimed, *I am still a painter*. Julio Romano, on seeing some of Corregio's pictures at Parma, declared they were superior to any thing in painting he had yet beheld. One of these no doubt would be the famous Virgin and Child, with Mary Magdalene and St Jerom: But whether our readers are to depend upon his opinion, or upon that of Lady Millar, who in her *Letters from Italy* gives a very unfavourable account of it, we shall not presume to determine. This lady, however, speaks in a very different style of the no less famous *Notte* or Night of Corregio, of which she saw only a copy in the Duke's palace at Modena, the original having been sold for a great sum of money to the king of Poland. "It surprises me very much (says she), to see how different the characters are in this picture from that which I already have described to you. The subject is a Nativity; and the extraordinary beauty of this picture proceeds from the *clair obscure*:

obscure: there are two different lights introduced, by means of which the personages are visible; namely, the light proceeding from the body of the child, and the moon-light. These two are preserved distinct, and produce a most wonderful effect. The child's body is so luminous, that the superficies is nearly transparent, and the rays of light emitted by it are verified in the effect they produce upon the surrounding objects. They are not rays distinct and separate, like those round the face of a sun that indicates an insurance-office; nor linear, like those proceeding from the man in the almanack; but of a dazzling brightness: by their light you see clearly the face, neck, and hands, of the Virgin (the rest of the person being in strong shadow), the faces of the *pastori* who crowd round the child, and particularly one woman, who holds her hand before her face, lest her eyes should be so dazzled as to prevent her from beholding the Infant. This is a beautiful natural action, and is most ingeniously introduced. The straw on which the child is laid appears gilt, from the light of his body shining on it. The moon lights up the back-ground of the picture, which represents a landscape. Every object is distinct, as in a bright moon-light night; and there cannot be two lights in nature more different than those which appear in the same picture. The virgin and the child are of the most perfect beauty. There is a great variety of character in the different persons present, yet that uniformity common to all herdsmen and peasants. In short, this copy is so admirable, that I was quite sorry to be obliged to lose sight of it so soon; but I never shall forget it. The duke of Modena, for whom Corregio did the original picture, gave him only 600 livres of France for it; a great sum in those days: but at present, what ought it to cost?" This great painter's death happened in 1534.

ALLEGRO, in music, an Italian word, denoting that the part is to be played in a sprightly, brisk, lively, and gay manner.

Piu ALLEGRO, signifies, that the part it is joined to should be sung or played quicker; as

Poco piu ALLEGRO intimates, that the part to which it refers ought to be played or sung only a little more briskly than allegro alone requires.

ALLEIN (Joseph), the son of Tobias Allein, was born in the Devizes, in Wiltshire, in 1633, and educated at Oxford. In 1655, he became assistant to Mr Newton, in Taunton-Magdalen, in Somersetshire; but was deprived for non-conformity. He died in 1668, aged 35. He was a man of great learning, and greater charity; preserving, though a non-conformist and a severe sufferer on that account, great respect for the church, and loyalty to his sovereign. He wrote several books of piety, which are highly esteemed; but his *Alarm to unconverted sinners* is more famous than the rest. There have been many editions of this little pious work, the sale of which has been very great; of the edition 1672, there were 20,000 sold; of that of 1675, with this title, *A sure guide to heaven*, 50,000. There was also a large impression of it with its first title, in 1720.

ALLELUIAH, or HALLELUIAH, a word signifying, *praise the Lord*, to be met with either at the beginning or end of some psalms: such is psalm cxlv. and those that follow, to the end. Alleluiah was sung upon solemn days of rejoicings, Tobit xiii. 12. St John in the Revelations (xix. 1, 3, 4, 6.) says, that he "heard a great voice of much people in heaven, who said, Alleluiah; and the four and twenty elders, and the four beasts, fell down and worshipped God that sat on the throne, saying *Alleluiah*." This hymn of joy and praises was transferred from the synagogue to the church. St Jerom tells us, that at the funeral of Fabiola several psalms were sung with loud alleluiahs; and that the monks of Palestine were awakened, at their midnight watchings, with the singing of alleluiahs. So much energy has been observed in this term, that the ancient church thought proper to preserve it, without translating it either into Greek or Latin, for fear of impairing the genius and softness of it. The fourth council of Toledo has prohibited the use of it in times of Lent, or other days of fasting, and in the ceremonies of mourning: and, according to the present practice of the Romish church, this word is never repeated in Lent, nor in the obsequies of the dead; notwithstanding which, it is used in the mass for the dead, according to the mosarabic ritual, at the introit, when they sing, *Tu es portio mea, Domine, Alleluia, in terra viventium, Alleluia, Alleluia.* The singing alleluiah was oftentimes an invitatory or call to each other to praise the Lord.

ALLEMAND a sort of grave solemn music, with good measure, and a slow movement.—It is also a brisk kind of dance, very common in Germany and Switzerland.

ALLEMANNIC, in a general sense, denotes any thing belonging to the ancient Germans. Thus, we meet with Allemannic history, Allemannic language, Allemannic law, &c.

ALLEN (John) archbishop of Dublin in the reign of king Henry VIII. was educated in the university of Oxford; from whence removing to Cambridge, he there took the degree of bachelor of laws. He was sent by Dr Warham, archbishop of Canterbury, to the pope, about certain matters relating to the church. He continued at Rome nine years, and was created doctor of laws; either there or in some other university of Italy. After his return, he was appointed chaplain to Cardinal Wolsey, and was commissary or judge of his court as legate *à latere*; in the execution of which office he was suspected of great dishonesty, and even perjury. He assisted the cardinal in visiting, and afterwards suppressing, 40 of the smaller monasteries, for the erection of his college at Oxford and that at Ipswich. The cardinal procured for him the living of Dalby in Leicestershire, though it belonged to the master and brethren of the hospital of Burton Lazars. About the latter end of the year 1525 he was incorporated doctor of laws in the university of Oxford. On the 13th of March 1528 he was consecrated archbishop of Dublin, in the room of Dr Hugh Inge deceased; and about the same time was made chancellor of Ireland. He wrote, 1. *Epistola de Pallii significatione activa et passiva*; penned by him at the time when he received the archiepiscopal pall. 2. *De consuetudinibus ac statutis in tutoriis causis observandis.* He wrote also several other pieces relating to the church. His death, which happened in July 1534, was very tragical: for being taken in a time of rebellion by Thomas Fitzgerald, eldest son to the earl of Kildare, he was by his command most cruelly murdered, being brained like an ox, at Tartaine in Ireland, in the 58th year of his age. The place where the murder was committed was afterwards hedged in, overgrown, and unfrequented, in detestation of the fact.

Allen (Thomas), a famous mathematician of the 16th century, born at Utoxeter in Staffordshire the 21st of December 1542. He was admitted scholar of Trinity-college Oxford the 4th of June 1561; and in 1567 took his degree of master of arts. In 1570 he quitted his college and fellowship and retired to Gloucester-hall; where he studied very closely, and became famous for his knowledge in antiquity, philosophy, and mathematics. Having received an invitation from Henry earl of Northumberland, a great friend and patron of the mathematicians, he spent some time at the earl's house, where he became acquainted with those celebrated mathematicians Thomas Harriot, John Dee, Walter Warner, and Nathaniel Torporley. Robert earl of Leicester had a particular esteem for Mr Allen, and would have conferred a bishopric upon him, but his love of solitude and retirement made him decline the offer. His great skill in the mathematics made the ignorant and vulgar look upon him as a magician or conjurer: the author of a book intitled *Leicester's Commonwealth*, has accordingly accused him with using the art of figuring, to procure the earl of Leicester's unlawful designs, and endeavouring by the black art to bring about a match betwixt him and Queen Elizabeth. But without pretending to point out the absurdity of the charge, it is certain that the earl placed such confidence in Allen, that nothing material in the state was transacted without his knowledge; and the earl had constant information, by letter, from Mr Allen, of what passed in the university. Mr Allen was very curious and indefatigable in collecting scattered manuscripts relating to history, antiquity, astronomy, philosophy, and mathematics: these collections have been quoted by several learned authors, &c. and mentioned to have been in the Bibliotheca Alleniana. He published in Latin the second and third books of Claudius Ptolemy of Pelusium, *Concerning the Judgment of the Stars*, or, as it is commonly called, of the *Quadripartite Construction*, with an exposition. He wrote also notes on many of Lilly's books, and some on John Bale's work *De Scriptoribus M. Britanniæ*. Having lived to a great age, he died at Gloucester-hall on the 30th of September 1632.

ALLENDORF, a small town in the circle of the Upper Rhine, and in the landgravate of Hesse-Cassel, remarkable for its salt-works and three stone-bridges. It is seated on the river Weser, 15 miles east of Cassel; E. Long. 10. 5. N. Lat. 51. 26.

ALLER, a river which runs through the duchy of Lunenburg, and falls into the Weser a little below Verden.

Aller, *good*, in ancient writers. The word *aller* serves to make the expression of superlative signification. So, *aller-good* is the greatest good. Sometimes it is written *alder*.

ALLERION, or Alerion, in heraldry, a sort of eagle without beak or feet, having nothing perfect but the wings. They differ from martlets by having their wings expanded, whereas those of the martlet are close; and denote imperialists vanquished and disarmed; for which reason they are more common in French than in German coats of arms.

ALLESTRY (Richard, D. D.) an eminent divine, born at Uppington in Shropshire in March 1619, was educated in the grammar-school at Coventry, and afterwards at Christ-church in Oxford. His parts, which were extraordinary, were improved by a no less extraordinary industry. He took up arms for king Charles I. and was sometimes seen with his musket in one hand and his book in the other. He was very active in the service of king Charles II. before his restoration, and was employed by the royalists in transacting business with that prince during his exile; but was at last seized at Dover by a party of soldiers, and committed prisoner to Lambeth house, where he was confined six or eight weeks: but soon after the restoration he was made canon of Christ-church, created doctor of divinity, and appointed chaplain in ordinary to the king, and regius professor of divinity. In 1665 he was appointed provost of Eton college, where he raised the school, which he found in a low condition, to an uncommon pitch of reputation. The west side of the outward quadrangle of that college was built from the ground at his expence. The excellent Dr Hammond, who was his intimate friend, left him his valuable library, which he himself afterwards bequeathed to his successors in the divinity chair. He was eminent for his piety, benevolence, and integrity; for the sincerity of his friendship, and his disinterested temper. He wrote several books; and a collection of his sermons were printed after his decease by Dr Fell bishop of Oxford. He died August 28. 1680.

Allestry (Jacob), an English poet of the last century. He was the son of James Allestry, a bookseller of London who was ruined by the great fire in 1666. Jacob was educated at Westminster school, entered at Christ-church Oxford, in the act term 1671 at the age of 18. and was elected student in 1672. He took the degree in arts; was music-reader in 1679, and terræ filius in 1681; both which offices he executed with great applause, being esteemed a good philologist and poet. He had a chief hand in the verses and pastorals spoken in the theatre at Oxford May 21. 1681, by Mr. William Savile second son of the Marquis of Halifax, and George Cholmondeley second son of Robert viscount Kells (both of Christ-church), before James duke of York, his duchess, and the lady Anne; which verses and pastorals were afterwards printed in the "Examen Poeticum." He died October 15. 1686, and was buried in St Thomas's church-yard.

ALLEVEURE, a small brass Swedish coin, worth about ¼d. English money.

ALLEVIATION, denotes the making a thing lighter, and easier to bear or endure. It stands opposed to *aggravation*.

ALLEY (William), bishop of Exeter in the reign of queen Elizabeth, was born at Great Wycomb in Buckinghamshire. From Eton school, in the year 1528, he removed to king's-college Cambridge, where he took the degree of bachelor of arts. He also studied some time at Oxford; afterwards he married, was presented to a living, and became a zealous reformer. Upon queen Mary's accession he left his cure and retired into the north of England; where he maintained his wife and himself by teaching a school, and practising physic. Queen Elizabeth ascending the throne, he went to London, where he acquired great reputation by reading the divinity-lecture at St Paul's, and in in July 1560 was consecrated bishop of Exter. He was created doctor of divinity at Oxford in November 1561. He died on the 15th of April 1570, and was buried at Exter in the cathedral. He wrote, 1. *The poor man's library*, 2 vol. fol. Lond. 1571. These volumes contain twelve lectures on the first epistle of St Peter, read at St Paul's. 2. *A Hebrew grammar*. Whether it was ever published is uncertain. He translated the Pentateuch, in the version of the Bible which was undertaken by queen Elizabeth's command.

Alley, in gardening, a straight parallel walk, bounded on both sides with trees, shrubs, &c. and usually covered with gravel or turf.

Alley, among builders, denotes a narrow passage leading from one place to another.

Alley, in perspective, that which, in order to have a greater appearance of length, is made wider at the entrance than at the termination.

Alley, in the new husbandry, implies the vacant space between the outermost row of corn on one bed and the nearest row to it on the next parallel bed; and it is usually about four feet in breadth, exclusive of the partitions between the rows of corn in the beds. The first hoeing of wheat is performed in the beginning of winter, and the earth is ploughed away from the rows into the intervals, which forms small ridges in the middle between the double rows. The second hoeing is in the spring, which turns it back to the rows, leaving a furrow in the middle of the alley. The third hoeing is from the rows, after the wheat has blossomed; this turns the earth into the intervals, forming small ridges there, as at the first hoeing. The fourth hoeing returns the earth to the ridges, which is performed a month or more after the third hoeing. This commonly finishes the horse-hoeings, if the land is in good heart; otherwise one or two more hoeings are necessary.

ALLEYN (Edward), a celebrated English actor in the reigns of queen Elizabeth and king James, and founder of the college at Dulwich in Surry, was born at London, in the parish of St Gotolph, Sept. 1. 1566, as appears from a memorandum of his own writing. Dr Fuller says, that he was bred a stage-player; and that his father would have given him a liberal education, but that he was not turned for a serious course of life. He was, however, a youth of an excellent capacity, a cheerful temper, a tenacious memory, a sweet elocution, and in his person of a stately port and aspect; all which advantages might well induce a young man to take to the theatrical profession. By several authorities we find he must have been on the stage some time before 1592; for at this time he was in high favour with the town, and greatly applauded by the best judges, particularly by Ben Johnson.

Haywood, in his prologue to Marloe's Jew of Malta, calls him Proteus for shapes, and Roscius for a tongue. He usually played the capital parts, and was one of the original actors in Shakespeare's plays; in some of Ben Johnson's he was also a principal performer: but what characters he personated in either of these poets, it is difficult now to determine. This is owing to the inaccuracy of their editors, who did not print the names of the players opposite to the characters they performed, as the modern custom is; but gave one general list of actors to the whole set of plays, as in the old folio edition of Shakespeare; or divided one from the other, setting the dramatis personæ before the plays, and the catalogue of performers after them, as in Johnson's

It may appear surprising how one of Mr Alleyn's profession should be enabled to erect such an edifice as Dulwich College, and liberally endow it for the maintenance of so many persons. But it must be observed that he had some paternal fortune, which, though small, might lay a foundation for his future affluence; and it is to be presumed, that the profits he received from acting, to one of his provident and managing disposition, and one who by his excellence in playing drew after him such crowds of spectators, must have considerably improved his fortune: besides, he was not only an actor, but master of a playhouse, built at his own expence, by which he is said to have amassed considerable wealth. He was also keeper of the king's wild beasts, or master of the royal bear-garden, which was frequented by vast crowds of spectators; and the profits arising from these sports are said to have amounted to 500l per annum. He was thrice married; and the portions of his two first wives, they leaving him no issue to inherit, might probably contribute to this benefaction. Such kind of donations have been frequently thought to proceed more from vanity and ostentation than real piety; but this of Mr Alleyn has been ascribed to a very singular cause, for the devil has been said to be the first promoter of it. Mr Aubrey mentions a tradition, "That Mr Alleyn playing a demon with six others, in one of Shakespeare's plays, was, in the midst of the play, surprised by an apparition of the devil; which so worked on his fancy, that he made a vow, which he performed by building Dulwich College" He began the foundation of this college; under the direction of Inigo Jones, in 1614; and the buildings, gardens, &c. were finished in 1617, in which he is said to have expended about 10,000l. After the college was built, he met with some difficulty in obtaining a charter for settling his lands in mortmain: for he proposed to endow it with 800l. per annum for the maintenance of one master, one warden, and four fellows, three whereof were to be clergymen, and the fourth a skilful organist; also six poor men, and as many women, besides twelve poor boys to be educated till the age of fourteen or sixteen, and then put out to some trade or calling. The obstruction he met with arose from the lord chancellor Bacon, who wished king James to settle part of those lands for the support of two academical lectures; and he wrote a letter to the Marquis of Buckingham, dated August 18. 1618, intreating him to use his interest with his Majesty for that purpose. Mr Alleyn's solicitation was however at last complied with, and he obtained the royal licence, giving him full power to lay his foundation, by his Majesty's letter-patent, bearing date the 21st of June, 1619; by virtue whereof he did, in the chapel of the said new hospital at Dulwich, called "The College of God's Gift," on the 13th of September following, publicly read and published a quadripartite writing in parchment, whereby he created and established the said college; he then subscribed it with his name, and fixed his seal to several parts thereof, in presence of several honourable persons, and ordered copies of the writings to four different

different parishes. He was himself the first master of his college; so that to make use of the words of Mr Haywood, one of his contemporaries, "He was so "mingled with humility and charity, that he became "his own pensioner, humbly submitting himself to "that proportion of diet and clothes which he had "bestowed on others." We have no reason to think he ever repented of this distribution of his substance; but on the contrary, that he was entirely satisfied, as appears from the following memorial in his own writing, found amongst his papers: "May 26, 1620— "My wife and I acknowledged the fine at the common pleas bar, of all our lands to the college: blessed be God that he has given us life to do it." His wife died in the year 1623; and about two years afterwards he married Constance Kinchtoe, who survived him, and received remarkable proofs of his affection, if at least we may judge of it by his will, wherein he left her considerably. He died Nov. 25. 1626, in the 61st year of his age, and was buried in the chapel of his new college, where there is a tomb-stone over his grave, with an inscription. His original Diary is also there preserved.

The subjoined anecdote is entertaining in itself, and shows the high esteem in which Mr Alleyn was held as an actor: 'Edward Alleyn, the Garick of Shakespear's time, had been on the most friendly footing 'with our poet, as well as Ben Johnson. They used 'frequently to spend their evenings together at the 'sign of the Globe, somewhere near Black Friars, 'where the playhouse then was. The world need not 'be told, that the convivial hours of such a triumvirate must be pleasing as well as profitable, and may 'truly be said to be such pleasures as might bear the 'reflections of the morning. In consequence of one 'of these meetings, the following letter was written by 'G. Peel, a Fellow of Christ-church college, Oxford, 'and a dramatic poet, who belonged to the Club, to 'one Marle, and intimate of his:

"Friend Marle,

"I must desyr that my syster hyr watch, and the "cookerie book you promysed, may be sente bye the "man.——I never longed for thy company more than "last night: we were all very merrye at the Globe, "when Ned Alleyn did not scruple to affyrme pleasauntely to thy Friende Will, that he had stolen his "speech about the Qualityes of an actor's excellencye "in Hamlet hys Tragedye, from conversations manyfold whych had passed between them, and opinyons "given by Alleyn touching the subjecte.——Shakespeare did not take this talke in good sorte; but "Johnson put an end to the strife with wittylye remarkinge, *This affaire needeth no Contention; you stole it from Ned, no doubte; do not marvel: Have you not seen him act tymes out of number?*—Believe "me most syncerilie, yours, *G. Peel.*"

ALLIA, a river of Italy, which running down a very steep channel from the mountains of Crustuminum, mixes with the Tiber at 40 miles from Rome; famous for the great slaughter of the Romans by the Gauls, under Brennus; hence *Alliensis dies*, an unlucky day, (Virgil, Ovid, Lucan.) Our ancestors, says Cicero, deemed the day of the fight of *Allia* more fatal than that of taking the city.

ALLIANCE, in the civil and canon law, the relation contracted between two persons or two families by marriage.

ALLIANCE is also used for a treaty entered into by sovereign princes and states, for their mutual safety and defence.—In this sense, alliances may be distinguished into such as are offensive, whereby the contracting parties oblige themselves jointly to attack some other power; and into defensive ones, whereby they bind themselves to stand by and defend each other in case they are attacked by others.—Alliance, with the ancient Romans, though a sort of servitude, was much coveted. Ariarathes, we are told by Polybius, offered a sacrifice to the gods by way of thanksgiving for having obtained alliance. The reason was, that thenceforwards people were sure not to receive any injuries except from them.—There were different sorts of allies: some only united to them by a participation of the privileges of Romans, as the Latini and Hernici; others by their very foundation, as the colonies; others by the benefactions they received from them, as Massinissa, Eumenes, and Attalus, who owed their kingdoms to Rome; others by free treaties, which last by a long alliance became subjects, as the kings of Bithynia, Cappadocia, Egypt, and most of the cities of Greece: lastly, others by compulsive treaties, and the law of subjection, as Philip and Antiochus. For they never granted peace to an enemy, without making an alliance with him; that is, they never subdued any people without using it as a means of subduing others.

The forms or ceremonies of alliances have been various in different ages and countries. At present, signing and swearing, sometimes at the altar, are the chief; anciently eating and drinking together, chiefly offering sacrifices together, were the customary rite of ratifying an alliance. Among the Jews and Chaldeans, heifers or calves; among the Greeks, bulls or goats; and among the Romans, hogs were sacrificed on this occasion. Among the ancient Arabs, alliances were confirmed by drawing blood out of the palms of the hands of the two contracting princes with a sharp stone, dipping herein a piece of their garments, and therewith smearing seven stones, at the same time invoking the gods Vrotalt and Alilat, *i. e.* according to Herodotus, Bacchus and Urania. Among the people of Cholchis, the confirmation of alliances is said to be effected by one of the princes offering his wife's breasts to the other to suck, which he was obliged to do till there issued blood.

ALLIANCE, in a figurative sense, is applied to any kind of union or connection; thus we say, there is an alliance between the church and state.

ALLIGATI, in Roman antiquity, the basest kind of slaves, who were usually kept fettered. The Romans had three degrees, or orders, of slaves or servants; the first employed in the management of their estates; the second in the medial or lower functions of the family; the third called *alligati*, abovementioned.

ALLIGATION, the name of a method of solving all questions that relate to the mixture of one ingredient with another. Though writers on arithmetic generally make alligation a branch of that science; yet, as it is plainly nothing more than an application of the common properties of numbers, in order to solve a few questions that occur in particular branches of business, we we chooſe rather to keep it diſtinct from the ſcience of arithmetic.

Alligation is generally divided into *medial* or *alternate*.

Alligation Medial, from the rates and quantities of the ſimples given, diſcovers the rate of the mixture.

Rule. As the total quantity of the ſimples,
To their price or value;
So any quantity of the mixture,
To the rate.

Examp. A grocer mixeth 30 lb. of currants, at 4d. per lb. with 10 lb. of other currants, at 6d. per lb.: What is the value of 1 lb. of the mixture? *Anſ.* $4\frac{1}{2}$ d.

lb.	*d.*		*d.*
30, at	4	amounts to	120
10, at	6	————	60
40			180

lb. *d.* *lb.* *d.*
If 40 : 180 :: 1 : $4\frac{1}{2}$

Note 1. When the quantity of each ſimple is the ſame, the rate of the mixture is readily found by adding the rates of the ſimples, and dividing their ſum by the number of ſimples. Thus,

Suppoſe a grocer mixes ſeveral ſorts of ſugar, and of each an equal quantity, viz. at 50s. at 54s. and at 60s: per cwt. the rate of the mixture will be 54s. 8d. per cwt.; for

l. *s.* *d.*
50+54+60=164, and 3)164) 54 8

Note 2. If it be required to increaſe or diminiſh the quantity of the mixture, ſay, As the ſum of the given quantities of the ſimples, to the ſeveral quantities given; ſo the quantity of the mixture propoſed, to the quantities of the ſimples ſought.

Note 3. If it be required to know how much of each ſimple is an aſſigned portion of the mixture, ſay, As the quantity of the mixture, to the ſeveral quantities of the ſimples given; ſo the quantity of the aſſigned portion, to the quantities of the ſimples ſought. Thus,

Suppoſe a grocer mixes 10 lb. of raiſins with 30 lb. of almonds and 40 lb. of currants, and it be demanded, how many ounces of each ſort are found in every pound or in every 16 ounces of the mixture, ſay,

Oz.
80 : 10 :: 16 : 2 raiſins.
80 : 30 :: 16 : 6 almonds.
80 : 40 :: 16 : 8 currants.

Proof 16

Note 4. If the rates of two ſimples, with the total value and total quantity of the mixture, be given, the quantity of each ſimple may be found as follows, viz. Multiply the leſſer rate into the total quantity, ſubtract the product from the total value, and the remainder will be equal to the product of the exceſs of the higher rate above the lower, multiplied into the quantity of the higher-priced ſimple; and conſequently the ſaid remainder, divided by the difference of the rates, will quote the ſaid quantity. Thus,

Suppoſe a grocer has a mixture of 400 lb. weight, that coſt him 7l. 10s. conſiſting of raiſins at 4d. per lb. and almonds at 6d. how many pounds of almonds were in the mixture?

	lb.	*Rates.*
	400	6 d.
L. *s.* *d.*	4	4 d.
7 10=1800		
1600	1600 d.	2 d.

	L.	*s.*
2)200(100lb. of almonds at 6 d. is	2	10
And 300lb. of raiſins at 4 d. is	5	0
Total 400 Proof	7	10

Alligation Alternate, being the converſe of alligation medial, from the rates of the ſimples, and rate of the mixture given, finds the quantities of the ſimples.

Rules. I. Place the rate of the mixture on the left ſide of a brace, as the root; and on the right ſide of the brace ſet the rates of the ſeveral ſimples, under one another, as the branches. II. Link or alligate the branches, ſo as one greater and another leſs than the root may be linked or yoked together. III. Set the difference betwixt the root and the ſeveral branches right againſt their reſpective yoke-fellows. Theſe alternate differences are the quantities required. Note 1. If any branch happen to have two or more yoke-fellows, the difference between the root and theſe yoke-fellows muſt be placed right againſt the ſaid branch, one after another, and added into one ſum. 2. In ſome queſtions, the branches may be alligated more ways than one; and a queſtion will always admit of ſo many anſwers as there are different ways of linking the branches.

Alligation alternate admits of three varieties, viz. 1. The queſtion may be unlimited, with reſpect both to the quantity of the ſimples and that of the mixture. 2. The queſtion may be limited to a certain quantity of one or more of the ſimples. 3. The queſtion may be limited to a certain quantity of the mixture.

Variety I. When the queſtion is unlimited, with reſpect both to the quantity of the ſimples and that of the mixture, this is called *Alligation Simple*.

Examp. A grocer would mix ſugars, at 5 d. 7 d. and 10d. per lb. ſo as to ſell the mixture or compound at 8d. per lb.: What quantity of each muſt he take?

lb.

$$8\left\{\begin{array}{l}5\\7\\10\end{array}\right. \quad \begin{array}{l}2\\2\\3,1\end{array}\;\Bigg|\;\begin{array}{l}2\\2\\4\end{array}$$

Here the rate of the mixture 8 is placed on the left ſide of the brace, as the root; and on the right ſide of the ſame brace are ſet the rates of the ſeveral ſimples, viz. 5, 7, 10, under one another, as the branches; according to Rule I.

The branch 10 being greater than the root, is alligated or linked with 7 and 5, both theſe being leſs than the root; as directed in Rule II.

The difference between the root 8 and the branch 5, viz. 3, is ſet right againſt this branch's yoke-fellow 10. The difference between 8 and 7 is likewiſe ſet right againſt the yoke-fellow 10. And the difference betwixt 8 and 10, viz. 2, is ſet right againſt the two yoke-fellows 7 and 5; as preſcribed by Rule III.

As the branch 10 has two differences on the right, viz.

viz. 3 and 1, they are added; and the anſwer to the queſtion is, that 2lb. at 5d. 2lb. at 7d. and 4lb. at 10d. will make the mixture required.

The truth and reaſon of the rules will appear by conſidering, that whatever is loſt upon any one branch is gained upon its yoke-fellow. Thus, in the above example, by ſelling 4lb. of 10d. ſugar at 8d. per lb. there is 8d. loſt: but the like ſum is gained upon its two yoke-fellows; for by ſelling 2lb. of 5d. ſugar at 8d. per lb. there is 6d. gained; and by ſelling 2lb. of 7d. ſugar at 8d. there is 2d. gained; and 6d. and 2d. make 8d.

Hence it follows, that the rate of the mixture muſt always be mean or middle with reſpect to the rates of the ſimples; that is, it muſt be leſs than the greateſt, and greater than the leaſt; otherwiſe a ſolution would be impoſſible. And the price of the total quantity mixed, computed at the rate of the mixture, will always be equal to the ſum of the prices of the ſeveral quantities caſt up at the reſpective rates of the ſimples.

Variety II. When the queſtion is limited to a certain quantity of one or more of the ſimples, this is called *Alligation Partial*.

If the quantity of one of the ſimples may be limited, alligate the branches, and take their differences, as if there had been no ſuch limitation; and then work by the following proportion:

As the difference right againſt the rate of the ſimple whoſe quantity is given,
To the other differences reſpectively;
So the quantity given,
To the ſeveral quantities ſought.

Examp. A diſtiller would, with 40 gallons of brandy at 12s. per gallon, mix rum at 7s. per gallon, and gin at 4s. per gallon: How much of the rum and gin muſt he take, to ſell the mixture at 8s. per gallon?

				Gal.	
8	12	1,4	5	40 of brandy.	*Anſ.*
	7	4	4	32 of rum.	
	4	4	4	32 of gin.	

The operation gives for anſwer, 5 gallons of brandy, 4 of rum, and 4 of gin. But the queſtion limits the quantity of brandy to 40 gallons; therefore ſay,

If 5 : 4 : : 40 : 32.

The quantity of gin, by the operation, being alſo 4, the proportion needs not to be repeated.

Variety III. When the queſtion is limited to a certain quantity of the mixture, this is called *Alligation Total*.

After linking the branches, and taking the differences, work by the proportion following:

As the ſum of the differences,
To each particular difference;
So the given total of the mixture,
To the reſpective quantities required.

Examp. A vintner hath wine at 3s. per gallon, and would mix it with water, ſo as to make a compoſition of 144 gallons, worth 2s. 6d. per gallon: How much wine, and how much water muſt he take?

				Gal.	
30	36	30	120 of wine.	*Anſw.*
	0	6	24 of water.	
		36	144 total.	

120×36=4320
24+ 0= 0

Proof 144)4320(30
As 36 : 30 : : 144 : 120
As 36 : 6 : : 144 : 24.

There being here only two ſimples, and the total of the mixture limited, the queſtion admits but of one anſwer.

ALLIGATOR, in zoology, a ſynonyme of the lacerta crocodilus. See LACERTA.

Alligator Pear. See LAURUS.

ALLIONIA, in botany, a genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 48th order, *Aggregatæ*. The characters are: The common *calyx* is oblong, ſimple, three-flowered, five-parted, and perſiſtent; the proper one, obſcure, above: The proper *corolla* is monopetalous and funnel-ſhaped; the mouth quinquefid and erect: The *ſtamina* conſiſt of four briſtly filaments, longer than the corolla, and bending to one ſide; the antheræ are roundiſh: The *piſtillum* has an oblong germen beneath; the *ſtylus* is briſtly, and longer than the ſtamina; the ſtigmata are multifid and linear: There is no *pericarpium*: The *ſeeds* are ſolitary, oblong, and naked: The *receptaculum* is naked. There are two ſpecies, the violeacea and incarnata, both natives of America.

ALLIOTH, a ſtar in the tail of the greater bear, much uſe for finding the latitude at ſea.

ALLITERATION, an ornament of language chiefly uſed in poetry, and conſiſting in the repetition of the ſame letter at certain intervals. We do not remember to have ever ſeen any ſatisfactory account of alliteration in the writings of the critics. They ſeem to have paſſed it over in contemptuous ſilence; either as a falſe refinement or as a mere trifle. It perhaps deſerves a better fate. Many chapters have been compoſed on quantity, on the expreſſion reſulting from different arrangements of long and ſhort ſyllables, and on the powers of pauſes as they are variouſly placed, without a word of alliteration. This is the more extraordinary, as one ſhould think it impoſſible for any man to examine minutely, and, as it were, diſſect a number of verſes, without perceiving the vaſt abundance of this ornament. It is as if an anatomiſt ſhould publiſh a complete table of the arteries in the human body, and affect never to have ſeen a vein nor a nerve: for it may be affirmed, with ſmall danger of miſtake, that if you examine any number of verſes, remarkable either for ſweetneſs or for energy, they will be found in ſome degree alliterative. We do not pretend to ſay, that the ſweetneſs and energy of verſification depends chiefly on this circumſtance, yet we cannot help believing that it may claim ſome ſhare: for it is a conſtant appearance, as far as we have ever obſerved, that the poets whoſe fame is higheſt for verſification, are moſt extenſive dealers in this article.

The trifling poor appearance of the ornament itſelf, upon

upon a superficial view, and the frequent abuse of it are circumstances indeed which give no encouragement to a serious inquiry into its nature and operation. How common is it for writers, who affect to be comic, when in want of other means for raising a smile, to use affected alliteration with success. But, in the fine arts, no beauty nor grace is beyond the power of ridicule. The noblest attitudes in painting have been rendered laughable by caricatura. St Paul preaching at Athens, in the design of Raphael, appears elegant, noble, and in some degree awful. The same apostle, represented by Hogarth in nearly the same attitude, pleading before the governor Felix, seems altogether ridiculous. So the language and versification of Milton in the Paradise Lost appear only proper for the most elevated subjects. In the Splendid Shilling of Philips, they appear equally proper for the lowest. So fares it also with alliteration. Nor ought we to be mortified at the discovery, that much of the delight afforded by versification arises from a cause so pitiful as the repetition of the same letter twice, or oftner, on the accented parts of a verse; for there are many other causes of pleasure, which, when thus detected and taken to pieces, seem equally contempible.

We apprehend the principal operation of this ornament to be quite mechanical. It is easier for the organs of speech to resume, at short intervals, one certain conformation, than to throw themselves into a number of different ones, unconnected and discordant. For example, a succession of labials, interspersed at regular distances with dentals and gutturals, will be more easily pronounced than the succession of all the three at random. Sounds of which the articulation is easiest, are most completely in the power of the speaker. He can pronounce them slowly or rapidly, softly or with force, at pleasure. In this we imagine the power and advantage of alliteration is founded: for we would not lay any stress on the pleasure which can result to the ear from the repetition of the same letter. It has been compared to the frequent returns of the key-note in a musical strain; but that analogy is extremely faint. The ear, we presume, can be pleased with alliteration only in so far as it contributes to the supperior easiness of recitation; for what is recited with ease must be heard with pleasure.

These remarks might be confirmed and illustrated by numberless passages from the best poets. Some few lines will suffice, taken from Gray, who seems to have paid particular attention to this grace. He professed to have learned his versification from Dryden, as Dryden did from Spencer; and these three abound in alliteration above all the English poets. We choose Gray for another reason, in proof of what we mentioned before, that alliteration contributes not only to the *sweetness*, but also to the *energy*, of versification; for he uses it chiefly when he aims at strength and boldness. In the *Sister Odes* (as Dr Johnson styles them), almost every strophe commences and concludes with an alliterative line. The poet, we suppose, wished to begin with force, and end with dignity.

"*R*uin seize thee, *r*uthless king."
"To *h*igh-born *H*oel's *h*arp, or soft *L*lewe*l*lyn's *l*ay."
"*W*eave the *w*arp, and *w*eave the *w*oof."
"Stamp we our vengeance *d*eep, and ratify his *d*oom."
"Regardless of the *s*weeping whirlwind's *s*way."
"That hush'd in grim re*p*ose, ex*p*ects his ev'ning *p*rey.".

It must be observed here, that we hold a verse alliterative which has a letter repeated on its accented parts, although those parts do not begin words; the repeated letter bearing a strong analogy to the bars in a musical phrase. Gray seems to have had a particular liking to these sort of balanced verses, which divide equally, and of which the opposite sides have an alliterative resemblance.

"Eyes that *g*low, and fangs that *g*rin,
"Thoughts that *b*reathe, and words that *b*urn."
"*H*auberk crash, and *h*elmet ring."

All these lines appear to us to have a force and energy, arising from alliteration, which renders them easy to be recited; or, if the reader pleases, *mouthed*. For the same reason the following passage appears sad and solemn, by the repetition of the labial liquid.

"*M*ountains, ye *m*ourn in vain."
"*M*odred whose *m*agic,"—&c.

If alliteration thus contributes to enforce the expression of a poetical sentiment, its advantages in poetry must be considerable. It is not, therefore, unworthy a poet's regard in the act of composition. If two words offer of equal propriety, the one alliterative the other not, we think the first ought to be chosen. We would compare this to the practice of fuguing in music. A composer who aims at expression will not hunt after fugues; but if they offer, if they seem to arise spontaneously from the subject, he will not reject them. So a good poet ought not to select an epithet merely for beginning with a certain letter, unless it suit his purpose well in every other respect; for the beauty of alliteration, when happy, is not greater than its deformity when affected. A couplet from Pope will exemplify both; the first line being bad, and the second good:

"Eternal beauties grace the *s*hining *s*cene,
"Fields ever *f*resh, and *g*roves for ever *g*reen."

ALLIUM (from ἀλεω, "to avoid or shun," because many shun the smell of it), Garlic: A genus of the monogynia order, belonging to the hexandria class of plants; and in the natural method ranking in the 9th order, *Spathaceæ*. The characters are: The *calyx* is a common spatha, roundish, withering, and multiflorous: The *corolla* consists of six oblong petals: The *stamina* have six subulated filaments, often the length of the corolla; the antheræ are oblong and erect: The *pistillum* has a germen above, shorter, nearly three-cornered, with angles engraved with a line; the styli are simple, the stigmata acute: The *pericarpium* is a very short, broad, three-lobed capsule, with three cells and three valves: The *seeds* are many and roundish. Of this genus no fewer than 40 different species are enumerated by Linnæus, among which he includes the cepa and porrum, or onions and leeks.

1. The sativum, or garlic, has a bulbous root, of an irregular roundish shape, with several fibres at the bottom; each root is composed of a number of lesser bulbs, called *cloves* of garlic, inclosed in one common membranous

membranous coat, and easily separable from one another. All the parts of this plant, but more especially the roots, have an acrimonious, and almost caustic taste, with a strong offensive smell, which last has induced those who preserved some of the species in gardens on account of their yellow flowers, to eradicate them.

This pungent root warms and stimulates the solids, and attenuates tenacious juices; for which it is well adapted, on account of its being very penetrating; insomuch that, when applied to the feet, its scent is soon discovered in the breath; and, when taken internally, its smell is communicated to the urine, or the matter of an issue, and perspires through the pores of the skin. Hence, in cold leucophlegmatic habits, it proves a powerful expectorant, diuretic, and emmenagogue; and, if the patient is kept warm, sudorific. It is also of great service in humoral asthmas and catarrhous disorders of the breast, and in other disorders proceeding from a laxity of the solids, and cold sluggish indispositions of the fluids. It is also frequently of service in the dropsy; in the beginning of which it is particularly recommended by Sydenham, as a warm strengthening medicine: we have even many examples where it acts so powerfully as a diuretic, as to carry off all the water of dropsies. It may be taken the length of a dram or two in substance for a dose.—There is a syrup and oxymel made with it, which may be employed for the same purposes as the garlic in substance; but they are mostly used in pulmonic disorders.—Externally applied, it inflames and ulcerates the skin, and is sometimes employed for this use in sinapisms. It has also been recommended by Sydenham as a most powerful revellent; for which purpose he was led to make use of it in the confluent small-pox. His method was to cut the root in pieces, and apply it, tied in a linen cloth, to the soles of the feet, about the eighth day of the disease, after the face began to swell; renewing it once a-day till the danger was over.—When made into an unguent with oils, and applied externally, garlic is said to resolve and discuss cold tumours, and has been by some greatly celebrated in cutaneous disorders.

The acrimonious qualities of this root, however, render it manifestly improper on many occasions. Its liberal use is apt to occasion head-achs, flatulencies, thirst, febrile heats, inflammatory distempers, and sometimes discharges of blood from the hemorrhoidal vessels. In hot bilious constitutions, where there is already a degree of irritation, where the juices are too thin and acrimonious, or the viscera unsound, it never fails to aggravate the distemper.

In Kamtschatka, the allium ursinum, or wild garlic, is very common and useful in medicine as well as food. Both Russians and natives gather it in great quantities for winter service. They steep it in water, then mix it with cabbage, onions, and other ingredients, and form out of them a ragout which they eat cold. It is also the principal remedy for the scurvy. As soon as this plant appears above the snow, they seem to put this dreadful disorder at defiance, and find a cure almost in its worst stages.

Garlic is very hardy, and will thrive in almost any soil or situation. It is easily propagated either by the roots or seeds. If from the roots, they ought to be planted in autumn, that they may take good root in the ground before the spring, which is necessary to make them flower strong the following summer. If they are propagated by seeds, they may be sown on a border of common earth, either in autumn soon after the seeds are ripe, or in the spring following; and will require no farther care than to keep them clear from weeds. In the following autumn, they may be transplanted into the borders where they are to remain.

2. The ascalonicum, or eschalot, was found wild in Palestine by Dr Hasselquist. The root is conglobate, consisting of many oblong roots bound together by thin membranes. Each of these small roots sends forth two or three fistulous, long, awl-shaped leaves, issuing from a sheath, and are nearly like those of the common onion. The flower-stem shoots from a membranaceous sheath; is round, almost naked, and terminated by a globular umbel of flowers, which have erect, purplish, lance-shaped petals, of the length of the stamina.—The root of this species is very pungent, has a strong but not unpleasant smell, and therefore is generally preferred to the onion for making high-flavoured soups and gravies. It is also put into pickles, and in the East Indies they use an abundance of it for this purpose.

3. The scorodoprasum, or rokambolé, grows natually in Denmark and Sweden. It hath a heart-shaped solid root, which stands sidewise of the stalk. The leaves are broad, and are a little crenated on their edges. The flowers are of a pale purple colour, and collected into a globular head. The roots are used for the same purpose as the former.

4. The schœnoprasum, or cives, is an inhabitant of Siberia, and is a very small plant compared with the former, the leaves and stems seldom exceeding six inches in length, and the roots never producing any bulbs. The leaves are awl-shaped, hollow, and the stem naked. It was formerly in great request for mixing with salads in the spring, but has been little regarded lately. Its taste, smell, and virtues, are much the same as those of the common onion. It is propagated by parting the roots.

5. The cepa, or common onion, differs from the garlic only in the swelling pipy stalk, which is much larger in the midle than at either end.—From whence this was first brought into Europe is not known; but that it is natural to Africa is beyond a doubt, it being evident that onions were eaten by the Egyptians above 2000 years before Christ; and they make a great part of their constant food to this day in Egypt. Dr Hasselquist says it is not to be wondered at that the Israelites should long for them after they had left this place; for whoever had tasted onions in Egypt must allow, that none can be had better in any part of the universe. Here, he observes, they are sweet, in other countries they are nauseous and strong. Here they are soft; whereas in the north and other parts they are hard, and their coats so compact that they are difficult to digest. They eat them roasted, cut into four pieces, with some bits of roasted meat, which the Turks call *kebab*; and with this dish they are so delighted, that they wish to enjoy it in paradise. They likewise make a soup of them in Egypt, which Hasselquist says is one of the best dishes he ever eat. The many ways of dressing onions in Britain are known to every family: but in regard to wholesomeness, there is certainly no method equal to boiling; as thus they are rendered mild, of easy digestion, and go off without leaving those heats in the stomach and bowels which

Allium.

which they are apt to do any other way. Their nature is to attenuate thick, viſcid juices; conſequently a plentiful uſe of them in cold phlegmatic conſtitutions muſt prove beneficial. Many people ſhun them on account of the ſtrong, diſagreeable ſmell they communicate to the breath. This may be remedied by eating a few raw parſley leaves immediately after, which will effectually overcome the ſcent of the onions, and cauſe them to ſit more eaſy on the ſtomach.

The varieties are, the Straſburgh, the Spaniſh, and the Egyptian onion. They are propagated by ſeeds, which ſhould be ſown the latter end of February, or the beginning of March, on good, light, rich ground, well dug and levelled, and cleared from weeds. They ſhould alſo be ſown at a time when the ſurface of the ground is not moiſt; and where they are intended for a winter crop, they muſt not be ſown too thick. The common allowance is ſix pounds of ſeed to an acre; though ſome allow more, in order to have a crop to draw out, which they call *cullings*. In about ſix weeks after, the onions will be up and forward enough to hoe; at which time the weeds ſhould be lightly cut up with a ſmall hoe about two inches and a half broad, as alſo the onions themſelves where they grow too cloſe in bunches, leaving them at this firſt time at leaſt two or three inches apart. This, if properly performed, and in a dry ſeaſon, will preſerve the ground clear of weeds at leaſt a month, when they muſt be hoed over again, leaving them at this time about four or five inches aſunder. In ſix weeks after they muſt be hoed a third time. The weeds are now to be carefully cut up, and the onions ſingled out ſo as to leave them about ſix inches ſquare; by which means they will grow much larger than if left too cloſe. This, if well performed, in caſe the weather proves dry, will keep the onions till they are fit to pull: but if the weather ſhould prove moiſt, and any of the weeds take root again, the weeds muſt be pulled out with the hand; for the onions having now begun to bulb, muſt not be diſturbed with a hoe. Towards the middle of Auguſt the onions will have arrived at their full growth, which may be known by their blades falling to the ground and ſhrinking. At this time, therefore, before their necks or blades are withered off, they ſhould be drawn out of the ground, the extreme part of the blade cut off, and the onions laid upon a dry ſpot of ground, obſerving to turn them every other day at leaſt, to prevent them from taking root again; which in moiſt weather they would be apt to do. At any rate, they are very apt to grow in the lofts where they are kept all winter; the moſt effectual method of preventing which is, with a hot iron, ſlightly to touch their beards or roots, which will effectually prevent their ſprouting; but in doing this, great caution muſt be uſed not to ſcorch the pulp, for that will cauſe them to periſh ſoon after. In order to ſave ſeeds, you muſt in the ſpring make choice of ſome of the largeſt, firmeſt and beſt ſhaped onions (in quantity proportionable to the ſeed you intend to ſave), and having prepared a piece of good ground, which ſhould be well dug, and laid out in beds about three feet wide, the onions muſt be planted in the beginning of March, in the following manner: Having ſtrained a line of about four inches within the ſide of the bed, you muſt with a ſpade throw out an opening ſix inches deep, the length of the bed, into which you ſhould place the onions with their roots downward, at about nine inches diſtance from each other; and with a rake draw the earth into the opening again to cover the bulbs: then proceed to remove the line again about a foot farther back, where you muſt make an opening as before, and ſo again, till the whole is finiſhed, by which you will have four rows in each bed; between each bed you muſt allow the ſpace of two feet for an alley to go among them. In a month's time the leaves will appear above ground, and many of the roots will produce three or four ſtalks each. About the beginning of June, when the flowers begin to appear, the ſtalks muſt be tied to ſtakes to prevent them from being broke by their own weight. About the end of Auguſt the ſeeds will be ripe; which may be known by the opening of the cells which contain it, and its changing to a brown colour. When the heads are cut off, they ſhould be ſpread abroad upon coarſe cloths in the ſun, obſerving to keep it under ſhelter in the night, as alſo in wet weather. When the heads are quite dry, the ſeeds ſhould be beat out from them; and after being cleared from the huſks, and expoſed one day to the ſun to dry, they may be put up in bags for uſe.

Allium, Allix.

Beſides the abovementioned ſorts of onions, the ſcallions or eſcallions, and Welſh onions, were formerly in great repute. The former is a ſort which never forms any bulbs at the roots, and was chiefly uſed in the ſpring for green onions; but is now become ſo ſcarce as hardly to be known. Some gardeners, inſtead of the ſcallion, ſubſtitute ſuch onions as decay and ſprout in the houſe. Theſe they plant in a bed early in the ſpring, and in a ſhort time they become large enough for uſe. The true ſcallion is eaſily propagated by parting the roots either in the ſpring or autumn; but the latter is preferable. The roots ſhould be planted three or four in a hole, and about ſix inches diſtance every way.—The Welſh onions are propagated only for ſpring uſe; they never make any bulbs, and are therefore fit only to be uſed green for ſalads. They are ſown in the end of July, in beds about three feet and a half wide. In a fortnight's time they appear above ground; but in October their blades die, and the ground becomes quite naked. In January, however, they will again appear very ſtrong, and in March will be fit to draw for young onions.

6. The porrum, or leek, has been ſo long cultivated, that its native place of growth cannot be traced. It is undoubtedly the ſame as that mentioned in the eleventh Chap. of Numbers, where it is ſaid the Iſraelites longed for leeks in conjunction with onions. The leaves are much of the ſame nature as thoſe of the latter, and they are yet a conſtant diſh at the tables of the Egyptians, who chop them ſmall and then eat them with their meat. They are in great eſteem, too, with the Welſh, and their general uſe as a pot herb is well known.—The culture is the ſame with that of the onion.

ALLIX (Dr Peter), a learned French Proteſtant divine, born at Alençon in 1641. He became miniſter of the reformed church at Rouen, where he publiſhed many learned and curious pieces; the credit of which induced the reformed to call him to Charenton, about a league from Paris, being the principal church they had in France. On the revocation of the edict of Nantz, he retired to England; where he studied the language with so much success, as to publish a work, intitled *Reflections on the Books in the Holy Scriptures, to establish the Truth of the Christian religin*, 2 vols; which he dedicated to James II. acknowledging his obligation to that prince, and his kind behaviour to the distressed refugees in general. He wrote several other treatises relating to ecclesiastical history; which rendered him as famous in England as in France, for his ingenious and solid defences of the reformed religion. He was complimented with the degree of D. D. and in 1690 was made treasurer of the church of Salisbury. He died in 1717.

ALLOA, or ALLOWAY, a sea-port town in Scotland, seated on the Forth, about 20 miles higher up the river than Leith, and five miles east of Stirling. It is a populous place; has two market days in the week; and is remarkable for its fine castle the seat of the earl of Mar, and for the coal-mines near it. The harbour is extremely commodious, with great depth of water; and vessels are expeditiously loaded with coals from the pits by an uncommon waggon-way, on which one horse draws with ease three waggons at once, each waggon containing a tun and a half. An excellent dry dock has also been lately erected here, capable of receiving ships of the greatest burden. There is likewise a large glass-house for blowing bottles, of which vessels are supplied with any quantity upon the shortest notice.

The tower and lands of Alloa were exchanged by David II. king of Scots, *anno* 1365, with Thomas Lord Erskine, for the lands and estate of Strathgartney in Perthshire; and since that time the castle of Alloa has been the favourite residence of the family of Mar. The situation is uncommonly beautiful. The gardens here were the first that were laid out on a great scale in Scotland; and, with the advice of Le Nautre, were indebted to the taste of John the late Earl of Mar, who began to plant them in the year 1706. They contain about 40 acres; and would have exhibited to Dr Johnson, had he travelled that way, as fine timber of fourscore years growth as his favourite England can produce.

The tower of Alloa is 89 feet in height, with walls of 11 feet in thickness; and was built in the end of the 13th century. In this residence of the family of Erskine, many of the Scottish princes received their education, having been for more than two centuries the wards of the Lords Erskine and Earls of Mar; who held generally the castle of Stirling, and frequently the three principal fortresses in that kingdom, Edinburgh, Stirling, and Dunbarton. The last heir of the Scottish monarchy who was nurtured there was Henry Prince of Wales; whose cradle, golf-clubs, and other infantine and youthful remains, are preserved by the heirs of the earls of Mar, in remembrance of that spirited and promising prince; of whom Dr Birch has preserved several anecdotes connected with the Erskines and his residence at Alloa.—Among other remains of antiquity preserved at Alloa, in remembrance of the confidence and affection which subsisted always betwixt the Stuarts and the Erskines, is the private signet of the unfortunate Mary, which she gave to the regent Mar, after she was obliged by the treaty of Edinburgh to desist from wearing the arms of England in the first quarter: the child's-chair of James VI. her son; and the festive-chair of Thomas Lord Erskine the second Earl of Mar of the name, with the fashionable grace carved on it, *Soli Deo Honor et Gloria*.

ALLOBROGES (Inscriptions, Livy, Velleius, Florus); from *Allobrox* (Horace): a people of Gallia Narbonensis, situated between the rivers Isara and Rhodanus, and the Lacus Lemanus; commended by Cicero for their fidelity, discommended by Horace on account of their fondness for novelty.

ALDOCATION denotes the admitting or allowing of an article of an account, especially in the exchequer. Hence,

ALLOCATIONE Facienda, is a writ directed to the lord treasurer, or barons of the exchequer, commanding them to allow an accountant such sums as he has lawfully expended in the execution of his office.

ALLOCUTIO, an oration or speech of a general addressed to his soldiers, to animate then to fight, to appease sedition, or to keep them to their duty. A mount of earth was raised upon the occasion, as it were a kind of tribunal of turf. From this the general pronounced his harangue to the army, which was ranged in several squadrons round him, with their captains at their head. When the time and circumstances would not admit of a formal harangue, the general went through the ranks, and called each by his name, putting them in mind of their courage upon former occasions, mentioning the victories they had won, and making promises of plunder.

ALLODIUM, or ALLEUD, denotes lands which are the absolute property of their owner, without being obliged to pay any service or acknowledgment whatever to a superior lord. See FEE and *FEUDAL System*.

ALLOPHYLLUS, in botany: a genus of the monogynia order, belonging to the octandria class of plants. The characters of which are: the *calyx* is a four-leaved perianthium, with orbicular leaflets, the opposite ones less: The *corolla* consists of four orbicular equal petals, less than the calyx; the claws broader, the length of the smaller leaves of the calyx: The *stamina* consist of eight slender filaments, the length of the corolla; the antheræ are roundish: The *pistillum* has a round didymous germen above; the stylus is filiform, and longer than the stamina; and the stigma is bifid, with revolute divisions. There is but one species, the zeylanicus, a native of Ceylon.

ALLOTTING, or *ALLOTMENT of Goods*, in matters of commerce, is when a ship's cargo is divided into several parts, bought by divers persons, whose names are written on as many pieces of paper, which are applied by an indifferent person to the several lots or parcels; by which means the goods are divided without partiality, every man having the parcel which the lot with his name on is appropriated.

ALLOY, or ALLAY, properly signifies a proportion of a baser metal mixed with a finer one. The alloy of gold is estimated by carats, that of silver by penny-weights. (See GOLD, &c.) In different nations, different proportions of alloy are used; whence their moneys are said to be of different degrees of fineness or baseness, and are valued accordingly in foreign exchanges.—The chief reasons alleged for the alloying

in

of coin are: 1. The mixture of the metals, which, when smelted from the mine, are not perfectly pure. 2. The saving the expence it must otherwise cost if they were to be refined. 3. The necessity of rendering them harder, by mixing some parts of other metals with them, to prevent the diminution of weight by wearing in passing from hand to hand. 4. The melting of foreign gold or coin which is alloyed. 5. The charges of coinage, which must be made good by the profit arising from the money coined. 6. and lastly, The duty belonging to the sovereign, on account of the power he has to cause money to be coined in his dominions.

In a more general sense, the word is employed in chemistry to signify the union of different metallic matters.—As an infinity of different combinations may be made according to the nature, the number, and the proportions of the metallic matters capable of being alloyed, we shall not here enter into the detail of the particular alloys, all which are not yet nearly known. Those which are used, as *Bronze*, *Tombac*, *Brass*, *White Copper*, &c. may be found under their particular names; and what is known concerning other alloys may be found under the names of the different metals and semimetals.

ALLUM. See Alum.

ALLUMINOR, from the French *alumer*, "to lighten," is used for one who coloureth or painteth upon paper or parchment; and the reason is, because he gives light and ornament by his colours to the letters or other figures. Such ornaments are styled *illuminations*. The word is used in stat. 1. R. III. cap. 9. But now such a person is called a *limner*.

ALLUSH, (anc. geog.) The Israelites being in the wilderness of Shur, departed from Dophkah, and went to Allush, from whence they proceeded to Rephidim; Num. xxxiii. 13, 14. Eusebius and St Jerom fix Allush in Idumæa, about Gabala or Petra, the capital of Arabia Petræa. In the accounts of the empire, it is situated in the third Palestine; and by Ptolemy, among the cities of Idumæa.

ALLUSION, in rhetoric, a figure by which something is applied to, or understood of, another, on account of some similitude between them.

ALLUVION, in law, denotes the gradual increase of land along the sea-shore, or on banks of rivers.

ALLY, in matters of polity, a sovereign prince or state that has entered into alliance with others. See Alliance.

ALMACANTARS. See Almucantars.

ALMACARRON, a sea-port town of Spain, in the province of Murcia, at the mouth of the river Guadalantin. It is about twenty miles west of Carthagena, and is remarkable for the prodigious quantity of alum found in its territory. W. Long. 1. 15. N. Lat. 37. 40.

ALMADE, a town of Spain, in the province of La Mancha, in the kingdom of Castile, situated upon the top of a mountain, where are the most ancient as well as the richest silver mines in Europe.

ALMADIE, a kind of canoe, or small vessel, about four fathoms long, commonly made of bark, and used by the negroes of Africa.

Almadie is also the name of a kind of long-boats, fitted out at Calicut, which are eighty feet in length, and six or seven in breadth. They are exceedingly swift, and are otherwise called *cathuri*.

ALMAGEST, in matters of literature, is particularly used for a collection or book composed by Ptolemy, containing various problems of the ancients both in geometry and astronomy.

Almagest is also the title of other collections of this kind. Thus Riccioli has published a book of astronomy, which he calls the *New Almagest*; and Pluckenet, a book which he calls *Almagestrum Botanicum*.

ALMAGRA, a fine deep red ochre, with some admixture of purple, very heavy, and of a dense yet friable structure, and rough dusty surface. It adheres very firmly to the tongue, melts easily and freely in the mouth, is of an austere and strongly astringent taste, and stains the skin in touching. It is the *Sil Atticum* of the ancients: it ferments very violently with acid menstruums; by which single quality, it is sufficiently distinguished from the *Sil Syricum*, to which it has in many respects a great affinity. It is found in immense quantities in many parts of Spain; and in Andalusia there are in a manner whole mountains of it. It is used in painting, and in medicine as an astringent.

ALMAGRO, a fortress of Spain, the capital of one of the districts of La Mancha. It was built by the archbishop Roderic of Toledo, who finished it in 1214, and put a considerable garrison into it to restrain the incursions of the Moors. This was hardly done, when the fortress was besieged by an army of 5000 horse and foot, under the command of a Moorish officer of great reputation; but the prelate, its founder, took care to supply those within with such plenty of necessaries, that at length the enemy found themselves obliged to raise the siege and retire with great loss.

ALMANACK, a book, or table, containing a calendar of days and months, the rising and setting of the sun, the age of the moon, the eclipses of both luminaries, &c.—Authors are divided with regard to the etymology of the word; some deriving it from the Arabic particle *al*, and *manach*, to count; some from *almanah*, new-year's gifts, because the Arabian astrologers used at the beginning of the year to make presents of their ephemerides; and others, from the Teutonic *almaen-achte*, observations on all the months. Mr Johnson derives it from the Arabic particle *al*, and the Greek μην, a month. But the most simple etymology appears from the common spelling; the word being composed of two Arabic ones, *Al Manack*, which signify *the Diary*. All the classes of Arabs are commonly much given to the study of astronomy and astrology; to both which a pastoral life, and a sort of husbandry, not only incline them, but give them time and leisure to apply themselves to them. They never sow, reap, plant, travel, buy or sell, or undertake any expedition or matter, without previously consulting the stars, or, in other words, their almanacks, or some of the makers of them. From these people, by their vicinity to Europe, this art, no less useful in one sense than stupid and ridiculous in another, hath passed over thither: and those astronomical compositions have still every where not only retained their old Arabic name; but were, like theirs, for a long while, and still are among many European nations, interspersed with a great number of astrological rules for planting, sowing, bleeding, purging, &c. down to the cutting of the hair and paring of

Almanack

of the nails.—Regiomontanus appears to have been the first in Europe, however, who reduced almanacks into their present form and method, gave the characters of each year and month, foretold the eclipses and other phases, calculated the motions of the planets, &c. His first almanack was first published in 1474.

Almanacks differ from one another, chiefly, in containing some more, others fewer, particulars.

The essential part is the calendar of months and days, with the risings and settings of the sun, age of the moon, &c. To these are added various parerga, astronomical, meteorological, chronological, political, rural, &c. as calculations and accounts of eclipses, solar ingresses, prognostics of the weather, tables of the tides, terms, &c. lists of posts, offices, dignities, public institutions, with many other articles political as well as local, and differing in different countries.—A great variety are annually published in Britain; some for binding, which may be denominated *book-almanacks*; others in loose papers, called *sheet-almanacks*.

The modern almanack answers to the *Fasti* of the ancient Romans. See FASTI.

Construction of ALMANACKS. The first thing to be done is, to compute the sun's and moon's place for each day of the year, or it may be taken from some ephemerides and entered into the almanack; next, find the dominical letter, and, by means thereof, distribute the calendar into weeks; then, having computed the time of easter, by it fix the other moveable feasts; adding the immoveable ones, with the names of the martyrs, the rising and setting of each luminary, the length of day and night, the aspects of the planets, the phases of the moon, and the sun's entrance into the cardinal points of the ecliptic, *i. e.* the two equinoxes and solstices. (See ASTRONOMY, *passim.*) By the help of good astronomical tables or ephemerides, the construction of almanacks is extremely easy.

In Britain almanacks for one year printed on one side of the paper, pay of the duty 2d.; those for more years pay for three years 1d.; but perpetual almanacks are to pay only for three years at 3d. Out of the duties by this act there shall be paid to each university L. 500 *per ann.* half yearly, at Midsummer and Christmas, and the surplus shall be paid into the exchequer to go to the sinking fund. Selling unstamped almanacks incurs the same penalty as for selling unstamped newspapers. Almanacks in bibles and common prayer books are exempted.

ALMANACK, among antiquaries, is also the name given to a kind of instrument, usually of wood, inscribed with various figures and Runic characters, and representing the order of the feasts, dominical letters, days of the week, and golden number, with other matters necessary to be known throughout the year; used by the ancient northern nations, in their computations of time, both civil and ecclesiastical. Almanacks of this kind are known by various names, among the different nations wherein they have been used; as rimstocks, primstaries, runstocks, runstaffs, *Scipiones Runici*, *Bacculi Annales*, clogs, &c. They appear to have been used only by the Swedes, Danes, and Norwegians. From the second of these people, their use was introduced into England, whence divers remains of them in the counties. Dr Plot has given the description and figure of one of these clogs, found in Staffordshire, under the title of *The perpetual Staffordshire Almanack*. The external figure and matter of these calendars appear to have been various. Sometimes they were cut on one or more wooden leaves, bound together after the manner of books; sometimes on the scabbards of swords, or even on daggers; sometimes on tools and implements, as portable steelyards, hammers, the helves of hatchets, flails, &c. Sometimes they were made of brass or horn; sometimes of the skins of eels, which, being drawn over a stick properly inscribed, retained the impressions of it. But the most usual form was that of walking staves, or sticks, which they carried about with them to church, market, &c. Each of these staves is divided into three regions; whereof the first indicates the signs, the second the days of the week and year, and the third the golden number. The characters engraven on them are, in some, the ancient Runic: in others, the later Gothic characters of Ulfilus. The saints days are expressed in hieroglyphics, significative either of some endowment of the saint, the manner of his martyrdom, or the like. Thus, against the notch for the first of March, or St David's day, is represented a harp; against the 25th of October, or Crispin's day, a pair of shoes; against the 10th of August, or St Lawrence's day, a gridiron; and, lastly, against New-year's day, a horn, the mark of good drinking, which they gave a loose to at that season.

Almanza, Heresy of Almaric.

ALMANZA, a little town of New-Castile, on the frontiers of the kingdom of Valencia in Spain, situated in W. Long. 1. 19. N. Lat. 38. 54. It is remarkable for the defeat of the allies in 1707, under the Marquis de las Minas and the Earl of Galway. In the beginning of this action, the English troops penetrated thro' the center of the Spanish army; but the Portuguese cavalry being broken by the Spanish, and the French infantry making a dreadful fire on their flanks, the allied army was at last broken, and began their retreat when it was almost dark. Colonel Hill carried off the remains of thirteen battalions towards the river Xucar, which, if they could have passed, they might have been safe: but being very much fatigued, they were obliged to halt; by which means they were surrounded, and forced to surrender prisoners of war. In this battle, the allies lost 120 standards, together with all their artillery and baggage; a great number were killed, and several thousands taken prisoners. The Marquis de las Minas was dangerously wounded; and his mistress, in the garb of an amazon, killed by his side. The earl of Galway had two cuts cross the face, which, though not dangerous, had prevented him from seeing, or giving orders properly.

HERESY OF ALMARIC, a tenet broached in France by one Almaric, in the year 1209. It consisted in affirming, that every Christian was actually a member of Christ; and that without this faith no one could be saved. His followers went farther, and affirmed, that the power of the Father lasted only during the continuance of the Mosaic law; that the coming of Christ introduced a new law; that at the end of this began the reign of the Holy Ghost; and that now confession and the sacraments were at an end, and that every one is to be saved by the internal operations of the Holy Spirit alone, without any external act of religion.—Their morals were as infamous as their doctrine was

was absurd. Their tenets were condemned by a public decree of the council of Sens, in the year 1209.

ALME, or Alma, singing and dancing girls in Egypt, who, like the Italian *Improvisatori*, can occasionally pour fourth "unpremeditated verse." They are called *Almé*, from having received a better education than other women. They form a celebrated society in this country. To be received into it, according to Mr Savary, it is necessary to have a good voice, to understand the language well, to know the rules of poetry, and be able to compose and sing couplets on the spot, adapted to the circumstances. The Almé know by heart all the new songs. Their memory is furnished with the most beautiful tales. There is no festival without them; no entertainment of which they do not constitute the ornament. They are placed in a rostrum, from whence they sing during the repast. They then descend into the saloon, and form dances which have no resemblance to ours. They are pantomime ballets, in which they represent the usual occurrences of life. The mysteries of love too, generally furnish them with scenes. The suppleness of their bodies is inconceiveable. One is astonished at the mobility of their features, to which they give at pleasure the impression suited to the characters they play. The indecency of their attitudes is often carried to excess. Their looks, their gestures, every thing speaks, but in so expressive a manner, that it is impossible to mistake them. At the beginning of the dance, they lay aside with their veils the modesty of their sex. A long robe of very thin silk goes down to their heels, which is slightly fastened with a rich girdle. Long black hair, plaited and perfumed, is flowing on their shoulders. A shift, transparent as guaze, scarcely hides their bosom. As they put themselves in motion, the shapes, the contours of their bodies, seem to develope themselves successively. Their steps are regulated by the sound of the flute, of castanets, the tambour de basque, and cymbals, which accelerates or retards the measure. They are still further animated by words adapted to such scenes. They appear in a state of intoxication. They are the Bacchants in a delirium. It is when they are at this point, that throwing off all reserve, they abandon themselves totally to the disorder of their senses; it is then that a people far from delicate, and who like nothing hidden, redouble their applauses. These Almé are sent for into all the harams. They teach the women the new airs; they amuse them with amorous tales, and recite in their presence poems, which are so much the more interesting, as they furnish a lively picture of their manners. They initiate them into the mysteries of their art, and teach them to contrive lascivious dances. These girls, who have a cultivated understanding, are very agreeable in conversation. They speak their language with purity. The habit of dedicating themselves to poetry renders the softest and most sonorous expressions familiar to them. They repeat with a great deal of grace. In singing, nature is their only guide. Sometimes two of them sing together, but always with the same voice. It is the same with an orchestra, where all the instruments playing in unison execute the same part.

The Almé assist at the marriage ceremonies, and march before the bride, playing on instruments. They make a figure likewise at funerals, and accompany the procession, singing sorrowful airs. They break forth into groans and lamentations, and give every sign of grief and despair. These women are paid very high, and seldom appear but amongst the grandees and rich men.

The common people have also their Almé. They are girls of the second class, who try to imitate the former; but they have neither their elegance, their graces, nor their knowledge. They are every where to be met with. The public places and the walks about Grand Cairo are full of them. As the populace require allusions still more strongly marked, decency will not permit the relation to what a pitch they carry the licentiousness of their gestures and attitudes.

ALMEDIA, a frontier-town of Portugal, in the province of Tralos Montes, on the confines of Leon, where there was a very brisk action between the French and Portuguese in 1663; 17 miles N. W. of Cividad Rodrigo. W. Long. 7. 10. N. Lat. 40. 41.

ALMEHRAB, in the Mahometan customs, a nich in their mosques, pointing towards the kebla or temple of Mecca, to which they are obliged to bow in praying. See Kebla.

ALMEISAR, a celebrated game among the ancient Arabs, performed by a kind of casting of lots with arrows, strictly forbid by the law of Mahomet, on account of the frequent quarrels occasioned by it.

The manner of the game was thus: A young camel being brought and killed, was divided into a number of parts. The adventurers, to the number of seven, being met, 11 arrows were provided without heads or feathers; seven of which were marked, the first with one notch, the second with two, the third with three, &c. the other four had no marks. These arrows were put promiscuously into a bag, and thus drawn by an indifferent person. Those to whom the marked arrows fell, won shares in proportion to their lot; the rest to whom the blanks fell, were entitled to no part of the camel, but obliged to pay the whole price of it. Even the winners tasted not of the flesh themselves more than the loosers, but the whole was distributed to the poor.

ALMENE, in commerce, a weight of two pounds used to weigh saffron in several parts of the continent of the E. Indies.

ALMERIA, a sea-port town in the kingdom of Granada in Spain, pleasantly situated in a fine bay at the mouth of the river Almeria, on the Mediterranean: W. Long. 3. 20. N. Lat. 36. 51. This town is by some thought to have risen upon the ruins of the ancient Abdera, and was formerly a place of great consequence. It was taken from the Moors in 1147, by the emperor Conrad III. in conjunction with the French, Genoese, and Pisans.—It was at that time the strongest place in Spain, held by the infidels; from which their privateers, which were exceedingly numerous, not only troubled the sea-coasts inhabited by the Christians, but gave equal disturbance to the maritime provinces of France, Italy, and the adjacent islands. The city being well fortified, having a strong castle, a numerous garrison, and being excellently provided with every thing necessary, made a vigorous resistance; but was at last taken by storm, when the victor put to the sword all the inhabitants who were found in arms, distributing the best part of the plunder among his allies,

lies, whom he sent away thoroughly satisfied. The Genoese, particularly, acquired here that emerald vessel which still remains in their treasury, and is deemed invaluable.

Upon its reduction by the Christians Almeria became a bishopric; but is at present very little better than a village, indifferently inhabited, and has nothing to testify so much as the probability of its former greatness, except certain circumstances which cannot be effaced even by the indolence of the Spaniards themselves. What these are, Udal ap Rhys, a Welshman, thus describes, in his tour through Spain and Portugal. "Its climate (says he) is so peculiarly blessed, that one really wants words to express its charms and excellence. Its fields and meads are covered with flowers all the year round; they are adorned also with palms, myrtles, plane-trees, oranges, and olives; and the mountains and promontories near it are as noted for their producing a great variety of precious stones, insomuch that the next promontory to is is called the *Cape of Gates*, which is a corruption from the word *agates*, the hills thereabouts abounding in that sort of precious stones, as well as in emeralds and amethysts, granites or coarse rubies, and extreme curious alabaster in the mountains of Filaures."

ALMISSA, a small but strong town at the mouth of the Cetina, in Dalmatia, famous for its piracies; ten miles east of Spalatro. E. Long. 39. 33. N. Lat. 43. 56.

ALMOND, the fruit of the almond-tree. See AMYGDALUS.

ALMOND, in commerce, a measure by which the Portuguese sell their oil; 26 almonds make a pipe.

ALMONDS, in anatomy, a name sometimes given to two glands, generally called the *tonsils*.

ALMONDS, among lapidaries, signify pieces of rock-crystal, used in adorning branch-candlesticks, &c. on account of the resemblance they bear to the fruit of that name.

ALMOND-Furnace, among refiners, that in which the slags of litharge, left in refining silver, are reduced to lead again by the help of charcoal.

ALMONDBURY, a village in England, in the west-riding of Yorkshire, six miles from Halifax.

ALMONER, in its primitive sense, denotes an officer in religious houses, to whom belonged the management and distribution of the alms of the house. By the ancient canons, all monasteries were to spend at least a tenth part of their income in alms to the poor. The almoner of St Paul's is to dispose of the monies left for charity, according to the appointment of the donors, to bury the poor who die in the neighbourhood, and to breed up eight boys to singing, for the use of the choir. By an ancient canon, all bishops are required to keep almoners.

Lord ALMONER, or *Lord High ALMONER, of England*, is an ecclesiastical officer, generally a bishop, who has the forfeiture of all deodands, and the goods of *felos de se*, which he is to distribute among the poor. He has also, by virtue of an ancient custom, the power of giving the first dish from the king's table to whatever poor person he pleases, or, instead of it, an alms in money.

Great ALMONER, *Grand AUMONIER*, in France, is the highest ecclesiastical dignity in that kingdom. To him belongs the superintendency of all hospitals and houses of lepers. The king receives the sacrament from his hand; and he says mass before the king in all grand ceremonies and solemnities.

ALMONER is also a more fashionable title given by some writers to chaplains. In this sense we meet with almoner of a regiment.

ALMONRY, or AUMBRY, the office or lodgings of the almoner; also the place where alms are given. See AUMBRY.

ALMS, a general term for what is given out of charity to the poor.

In the early ages of Christianity, the alms of the charitable were divided into four parts; one of which was allotted to the bishop, another to the priests, and a third to the deacons and subdeacons, which made their whole subsistence; the fourth part was employed in relieving the poor, and in repairing the churches.

No religious system is more frequent or warm in its exhortations to alms-giving than the Mahometan. The Alcoran represents alms as a necessary means to make prayer be heard. Hence that saying of one of their khalifs: "Prayer carries us half-way to God, fasting brings us to the door of his palace, and alms introduces us into the presence-chamber." Hence many illustrious examples of this virtue among the Mahometans. Hasan, the son of Ali, and grandson of Mohammed, in particular, is related to have thrice in his life divided his substance equally between himself and the poor, and twice to have given away all he had. And the generality are so addicted to the doing of good, that they extend their charity even to brutes.

ALMS, also denotes lands or other effects left to churches or religious houses, on condition of praying for the soul of the donor. Hence,

Free ALMS was that which is liable to no rent or service.

Reasonable ALMS was a certain portion of the estates of intestate persons, allotted to the poor.

ALMS-Box, or *Chest*, a small chest, or coffer, called by the Greeks κιβωτιον, wherein anciently the alms were collected, both at church and at private houses.

The alms-chest in English churches, is a strong box, with a hole in the upper part, having three keys, one to be kept by the parson or curate, the other two by the church-wardens. The erecting of such alms-chest in every church is enjoined by the book of canons, as also the manner of distributing what is thus collected among the poor of the parish.

ALMS-House, a petty kind of hospital, for the maintenance of a certain number of poor, aged, or disabled people.

ALMUCANTARS, in astronomy, an Arabic word denoting circles of the sphere passing through the centre of the sun, or a star, parallel to the horizon, being the same as *PARALLELS of Altitude*.

ALMUCANTARS-Staff, is an instrument usually made of pear-tree or box, having an arch of 15 degrees; used to take observations of the sun, about the time of its rising and setting; in order to find the amplitude, and consequently the variation of the compass.

ALMUCIUM, denotes a kind of cover for the head, worn chiefly by monks and ecclesiastics: It was of a square

square form, and seems to have given rise to the bonnets of the same shape still retained in universities and cathedrals.

ALMUGIM, or ALMUG-TREE, a certain kind of wood mentioned in the first book of Kings, (x. 11.) which the vulgate translates *ligna thyina*, and the Septuagent *wrought wood*. The Rabbins generally render it *coral*; others, *ebony*, *brazil*, or *pine*. But it is observed, that the almug-tree can by no means be coral, because that wood is not fit for the purposes that the Scripture tells us the almug-tree was used, such as musical instruments, stair-cases, &c. The word *thyinum* is a name for the citron-tree, known to the ancients, and very much esteemed for its sweet odour and great beauty. It came from Mauritania. The almug-tree, or almugim, algumim, or simply gummim, taking *al* for a kind of article, is therefore by the best commentators understood to be an oily and gummy sort of wood; and particularly that sort of tree which produces the gum ammoniac, which is also thought to be the same with the shittim-wood, whereof there is such frequent mention made by Moses.

ALMUNECAR, a sea-port town in the kingdom of Granada, seated on the Mediterranean, with a good harbour, defended by a strong castle, 20 miles south of Alhama. W. Long. 3. 45. N. Lat. 36. 50.

ALNAGE, or AULNAGE, the measuring of woollen manufactures with an ell. It was at first intended as a proof of the goodness of that commodity, and accordingly a seal was invented as a mark that the commodity was made according to the statute; but, it being now possible to purchase these seals, they are affixed, whenever the vender pleases, to all cloaths indiscriminately, to the great prejudice of the British woollen manufactures.

ALNAGER, ALNEGER, or AULNEGER, q. d. *measurer by the ell*; signifies a sworn public officer, who by himself, or deputy, is to look to the assize of woollen cloth made throughout the land, i. e. the length, width, and work thereof; and to the seals for that purpose ordained. The office of king's alnager seems to have been derived from the statute of Richard I. A. D. 1197, which ordained, that there should be only one weight and one measure throughout the kingdom; and that the custody of the assize, or standard of weights and measures, should be committed to certain persons in every city and borough. His business was, for a certain fee, to measure all cloth made for sale, till the office was abolished by the statute 11 and 12 W. III. cap. 20.

ALNUS, the ALDER-TREE, a species of betula. See BETULA.

ALNUS, in the ancient theatres, that part which was most distant from the stage.

ALNWICK, a thoroughfare town in Northumberland, on the road to Scotland. Here Malcolm, king of Scotland, making an inroad into Northumberland, was killed, with Edward his son, and his army defeated by Robert Mowbray, earl of this county, *anno* 1092. Likewise William, king of Scotland, in 1174, invading England with an army of 80,000 men, was here encountered, his army routed, and himself made prisoner. The town is populous, and in general well built; it has a large town-house, where the quarter-sessions and county-courts are held, and members of parliament elected. It has a spacious square, in which a market is held every Saturday. Alnwick appears to have been formerly fortified, by the vestiges of a wall still visible in many parts, and three gates which remain almost entire. It is governed by four chamberlains, who are chosen once in two years out of a common council, consisting of 24 members. It is ornamented by a stately old Gothic castle, which has been the seat of the noble family of Piercy, earls of Northumberland. As the audits for receipt of rents have ever been in this castle, it has always been kept in tolerable repair; and not many years ago, it was repaired and beautified by the duke of Northumberland, who made very considerable alterations, upon a most elegant plan, with a view to reside in it some part of the summer-season. The manner of making freemen is peculiar to this place, and indeed is as ridiculous as singular. The persons who are to be made free, or, as the phrase is, leap the well, assemble in the market-place, very early in the morning, on the 25th of April, being St Mark's day. They appear on horse-back, with every man his sword by his side, dressed in white, and with white night-caps, attended by the four chamberlains and the castle-bailiff, mounted and armed in the same manner; from hence they proceed, with music playing before them, to a large dirty pool, called *Freeman's-well*, where they dismount, and draw up in a body, at some distance from the water; and then rush into it all at once, and scramble through the mud as fast as they can. As the water is generally very foul, they come out in a dirty condition; but taking a dram, they put on dry clothes, remount their horses, and ride full gallop round the confines of the district; then re-enter the town, sword in hand, and are met by women dressed in ribbons with bells and garlands, dancing and singing. These are called *timber-wasts*. The houses of the new freemen are on this day distinguished by a great holly-bush, as a signal for their friends to assemble and make merry with them after their return. This ceremony was owing to king John, who was mired in this well; and who, as a punishment for not mending the road, made this a part of their charter. Alnwick is 310 miles north by west from London, 33 north of Newcastle, and 29 south of Berwick. W. Long. 1. 10. Lat. 55. 24.

ALOA, in Grecian antiquity, a festival kept in honour of Ceres by the husbandmen, and supposed to resemble our harvest-home.

ALOE, in botany, a genus of the monogynia order, belonging to the hexandria class of plants; and, in the natural method, ranking under the 10th order, *Coronariæ*. The characters are: There is no *calyx*: The *corolla* is monopetalous, erect, six-cleft, and oblong; the tube gibbous; the border spreading, and small; with a nectary-bearing bottom: The *stamina* consist of six subulated filaments, rather surpassing the corolla in length, and inserted into the receptacles; the antheræ are oblong and incumbent: The *pistillum* has an ovate germen; the stylus is simple, the length of the stamina; the stigma is obtuse and trifid: The *pericarpium* is an oblong capsule, three-furrowed, three-celled, three-valved: The *seeds* are many and angular. Of this genus, botanical writers enumerate ten species; of which the most remarkable are,

1. The disticha, by some called the *soap aloe*, by others

others *caballine aloe*. This seldom rises above two feet high. The leaves are very broad at the base, where they closely embrace the stalk, and gradually decrease to a point. The edges are set with sharp spines, and the under leaves spread open horizontally every way. These are of a dark green colour spotted with white, somewhat resembling the colour of soft soap, from whence the plant got the name of *soap-aloe*. The flowers grow in umbels on the tops of the stalks, are of a beautiful red colour, and appear in August and September. 2. The variegate, or partridge-breast aloe, is a low plant, seldom rising above eight inches high. The leaves of this are triangular, and curiously veined and spotted, somewhat like the feathers of a partridge's breast. The flowers grow in very loose spikes, and are of a fine red colour tipped with green. 3. The viscosa, with funnel-shaped flowers, grows near a foot high, with triangular leaves of a dark green colour. The flowers grow thinly upon very slender footstalks, are of an herbaceous colour, and their upper part turns backward. 4. The spiralis, with oval crenated flowers, grows somewhat like the former: only the flowers grow upon taller stalks, which branch out and grow in very long close spikes. 5. The linguisformæ, or tongue-aloe, has its leaves about six inches in length, and shaped like a tongue. The flowers grow in slender loose spikes, each hanging downward, of a red colour below, and green at the top. 6. The margaritifera, or pearl aloe, is a very beautiful plant. It is smaller than most of the aloe kind. The leaves are short, very thick, sharp pointed, and turning down, with a large thick end, appear there triangular. The colour of the leaves is a fine green, stripped in an elegant manner with white, and frequently tipped with red at the point. The flower-stalk, which rises in the midst of the leaves, is round, smooth, of a purple colour, and generally about eight inches high. When the plant has been properly cultivated, the flowers are striped with green and white; and sometimes they are entirely white. This aloe is singular in not having the bitter resinous juices with which the leaves of most others abound; when a leaf of this species is cut, what runs from it is watery, colourless, and perfectly insipid. 7. The perfoliata, or socotorine aloe, hath long, narrow, succulent leaves, which come out without any order, and form large heads. The stalk grows three or four feet high; and has two, three, and sometimes four, of these heads branching out from it. The flowers grow in long spikes, each standing on a pretty long footstalk; they are of a bright red colour tipped with green, and generally appear in the winter season. 8. The retusa, or cushion aloe, hath very short, thick, succulent leaves, compressed on the upper side like a cushion. This grows very close to the ground; the flowers grow on slender stalks, and are of an herbaceous colour.

Culture. The proper earth for planting these vegetables in, is, one half fresh light earth from a common, and the rest an equal mixture of white sea-sand and sifted lime-rubbish. This mixture should be always made six or eight months before the plants are to be set in it. The common aloe will live in a dry green-house in winter; and may be placed in the open air in summer, in a sheltered situation, but must have very little water. Most of the other aloes are best preserved in an airy glass-case, in which there is a stove, to make a little fire in very bad weather. The tenderest kinds require a greater share of heat to preserve them in winter, and should be kept in a good stove, in a degree of heat ten degrees above temperate. Many other kinds may also be kept in this heat; but the greater the heat, the more water they always require. About the beginning of June, it is usual in England to set the pots of aloes out of the house: but they should be set under the shelter of hedges or trees, to keep them from the violence of the sun; the rains also, which usually fall in this and the following month, are apt to rot them. It is therefore best to keep them under cover the greatest part of the year. The best time to shift these plants is the middle of July. They are, on this occasion, to be taken out of the pots, the loose earth to be picked from about their roots, and the decayed or mouldy parts of them cut off; then a few stones are to be put at the bottom of the pot, and it is to be filled with the composition already described, and the plants carefully put in, the roots being so disposed as not to interfere with one another. They are to be carefully watered after this, at times, for three weeks, and set in a shady place. The common kind will bear the open air from May till October, and should be shifted every year. All the aloes are propagated by offsets, or by planting the leaves. The off-sets should be taken from the mother plant, at the time when it is shifted: they are to be planted in very small pots of the proper mixed earth; and if that part of them which joined to the mother-plant be observed to be moist when taken off, it should lie on the ground in a shady place two or three days before it is planted, otherwise it will rot. After planting these, they should remain in a shady place a fortnight; and then be removed to a very moderate hot bed, plunging the pots therein, which will help their striking new roots. Towards the end of August they must be, by degrees, hardened to the open air, by taking off the glasses of the hot-bed; and in September they may be removed into the green-house.

Properties, &c. The *aloe* is a kind of symbolic plant to the Mahometans, especially in Egypt, and in some measure dedicated to the offices of religion; for whoever returns from a pilgrimage to Mecca, hangs it over his street-door, as a token of his having performed that holy journey. The superstitious Egyptians believe that this plant hinders evil spirits and apparitions from entering the house; and on this account, whoever walks the streets in Cairo, will find it over the doors both of Christians and Jews. From the same plant the Egyptians distil a water, which is sold in the apothecaries shops at Cairo, and recommended in coughs, hysterics, and asthmas. An unexperienced French surgeon, says Hasselquist, gave a Coptite, 40 years old, afflicted with the jaundice, four tea-cups full of the distilled water of this species of aloe, and cured him in four days. This remedy, unknown to our apothecaries, is not difficult to be obtained, as the plant might easily be raised in the warm southern parts of Europe. The Arabians call in *sabbara*.

Of the leaves of the Guinea aloe, mentioned by Mr Adanson in his voyage to Senegal, the negroes make very good ropes, not apt to rot in the water.

Dr Sloane mentions two sorts of aloe; one of which is

Aloe.

is used for fishing-lines, bow-strings, stockings, and hammocks; the other has leaves which, like those of the wild-pine and banana, hold rain-water, and thereby afford a very necessary refreshment to travellers in hot countries, where there is generally a scarcity of wells and water.

In Mexico, the *maguei*, a species of aloe, yields almost every thing necessary to the life of the poor. Besides making excellent hedges for their fields, its trunk served in place of beams for the roofs of their houses, and its leaves instead of tiles. From those leaves they obtained paper, thread, needles, clothing shoes, and stockings, and cordage; and from its copious juice they made wine, honey, sugar, and vinegar. Of the trunk, and thickest part of the leaves, when well baked, they made a very tolerable dish of food. Lastly, it was a very powerful medicine in several disorders, and particularly in those of the urine. It is also at present one of the plants the most valued and most profitable to the Spaniards.

The medical substance known by the name of *aloes* is the inspissated juice of some of the abovementioned species. The ancients distinguished two sorts of aloes: the one was pure and of a yellowish colour, inclining to red, resembling the colour of a liver, and thence named *hepatic*; the other was full of impurities, and hence supposed to be only the dross of the better kind. At present, various sorts are met with in the shops; which are distinguished either from the places, from the species of the plants, or from some difference in the juices themselves. These may be all ranged in three classes;

1 *Aloe Perfoliata*, socotorine aloe, brought from the island Socotora in the Indian ocean, wrapt in skins; it is obtained from the 5th species abovementioned—This sort is the purest of the three: it is of a glossy surface, clear, and in some degree pellucid: in the lump, of a yellowish red colour, with a purple cast; when reduced to powder, of a bright golden colour. It is hard and friable in the winter, somewhat pliable in summer, and grows soft betwixt the fingers. Its taste is bitter, accompanied with an aromatic flavour, but insufficient to prevent its being disagreeable: the smell is not very unpleasant, and somewhat resembles that of myrrh.

2. *Aloe Hepatica*, hepatic, Barbadoes, or common aloes (the juice of a variety of the former), is not so clear and bright as the foregoing sort; it is also of a darker colour, more compact texture, and for the most part drier. Its smell is much stronger and more disagreeable; the taste intensely bitter and nauseous, with little or nothing of the fine aromatic flavour of the socotorine.—The best hepatic aloes come from Barbadoes in large gourd-shells; an inferior sort of it (which is generally soft and clammy) is brought over in casks.

Of the cultivation and preparation of hepatic aloes in the island of Bardadoes, we have the following account in the London Medical Journal*. "The lands in the vicinity of the sea, that is, from two to three miles which are rather subject to drought than otherwise, and are so stony and shallow as not to admit of the planting of sugar canes with any prospect of success, are generally found to answer best for the aloe plant. The stones, at least the larger ones, are first picked up, and either packed in heaps, upon the most shallow barren spots, or laid round the field as a dry wall. The land is then lightly ploughed, and very carefully cleared of all noxious weeds, lined at one foot distance from row to row, and the young plants set, like cabbages, at about five or six inches distance from each other. This regular mode of lining and setting the plants is practised only by the most exact planters, in order to facilitate the weeding of them, by hand, very frequently; because, if they are not kept perfectly clean and free from weeds, the produce will be but very small. They will bear being planted in any season of the year, even in the driest, as they will live on the surface of the earth many weeks without a drop of rain. The most general time, however, of planting them, is from April to June.

*Vol. viii. Art. 8.

"In the March following, the labourers carry a parcel of tubs and jars into the field, and each takes a slip or breadth of it, and begins by laping hold of a bunch of the blades, as much as he can conveniently grasp in one hand, while with the other he cuts it just above the surface of the earth, as quickly as possible (that the juice may not be wasted), and then places the blades in the tub, bunch by bunch, or handful by handful. When the first tub is thus packed quite full, a second is begun (each labourer having two); and by the time the second is filled, all the juice is generally drained out of the blades in the first tub. The blades are then lightly taken out, and thrown over the land by way of manure; and the juice is poured out into a jar. The tub is then filled again with blades, and so alternately till the labourer has produced his jar full, or about four gallons and an half of juice, which is often done in six or seven hours, and he has then the remainder of the day to himself, it being his employer's interest to get each day's operation as quickly done as possible.—It may be observed, that although aloes are often cut in nine, ten, or twelve months after being planted, they are not in perfection till the second and third year; and that they will be productive for a length of time, say 10 or 12 years, or even for a much longer time, if good dung, or manure of any kind, is strewed over the field once in three or four years, or oftner if convenient.

"The aloe juice will keep for several weeks without injury. It is therefore not boiled till a sufficient quantity is procured to make it an object for the boiling-house. In the large way, three boilers, either of iron or of copper, are placed to one fire, though some have but two, and the small planters only one. The boilers are filled with the juice; and, as it ripens or becomes more inspissated, by a constant but regular fire, it is ladled forward from boiler to boiler, and fresh juice is added to that farthest from the fire, till the juice in that nearest to the fire (by much the smallest of the three, and commonly called by the name of *tatch*, as in the manufactory of sugar) becomes of a proper consistency to be skipped or ladled out into gourds, or other small vessels, used for its final reception. The proper time to skip or ladle it out of the tatch, is when it is arrived at what is termed a resin height, or when it cuts freely, or in thin flakes, from the edges of a small wooden slice, that is dipped from time to time into the tatch for that purpose. A little lime-water is used by some aloe-boilers, during the process, when the ebullition is too great.

"As

"As to the sun-dried aloes (which is most approved for medicinal purposes), very little is made in Barbadoes. The process is, however, very simple, though extremely tedious. The raw juice is either put into bladders, left quite open at top, and suspended in the sun, or in broad shallow trays of wood, pewter, or tin, exposed also to the sun, every dry day, until all the fluid parts are exhaled, and a perfect resin formed, which is then packed up for use, or for exportation."

The Barbadoes aloes is said to be common also in the other West India islands; and the following account of the manner of preparing it in Jamaica is given by Dr Wright in the same volume of the Medical Journal, art. 1. "The plant is pulled up by the roots, and carefully cleansed from the earth or other impurities. It is then sliced and cut in pieces into small hand-baskets or nets. These nets or baskets are put into large iron boilers with water, and boiled for ten minutes, when they are taken out, and fresh parcels supplied till the liquor is strong and black. At this period the liquor is thrown through a strainer into a deep vat, narrow at bottom, to cool, and to deposite its fæculent parts. Next day the clear liquor is drawn off by a cock, and again committed to the large iron vessel. At first it is boiled briskly: but towards the end of the evaporation is slow, and requires constantly stirring to prevent burning. When it becomes of the consistance of honey, it is poured into gourds or calabashes for sale. This hardens by age."

3. *Aloe-Caballina* fetid, caballine, or horse-aloe, is supposed to be a coarser sort obtained from the same species with the foregoing; according to others, it is the produce of the disticha. It is chiefly distinguished by its strong rank smell.

All the different kinds are gum-resins, which contain more gummous than resinous parts. Water, when of a boiling heat, dissolves all the soluble parts of aloes; but if let stand till it grows cold, it lets drop most of its resin. A strong spirit dissolves and keeps suspended almost the whole of aloes, though it contains such a large portion of gummous parts; hence it is evident, that aloes contains some principle, saline or other, which renders water capable of dissolving resin, and spirit capable of dissolving gum.

Aloe is a stimulating stomachic purge, which given in small quantity, operates mildly by stool; but in large doses acts roughly, and often occasions an irritation about the anus, and sometimes a discharge of blood. It is a good opening medicine to people of a lax habit, or who live a sedentary life; and to those whose stomach and bowels are loaded with phlegm or mucus, or who are troubled with worms, or are debilitated; because at the same time that it carries off those viscid humours which pall the appetite, and overload the intestines, it serves as a strengthener and bracer. In small doses, repeated from time to time, it not only cleanses the prima viæ, but likewise tends to promote, the menstrual discharge in women; and therefore it is frequently employed in chlorosis, or where the menstrua are obstructed. It is a good stomachic purge, and is given in all cases where such a one is wanted; but it is looked upon as a heating medicine, and not proper in bilious habits, or where there is much heat or fever; and its continued use is apt to bring on the piles.

It is given in substance from five grains to a scruple, though formerly it used to be prescribed in doses of two or three times that quantity; but these large doses sometimes brought on troublesome symptoms. As it is a slow working purge, it is generally taken at bed-time, and it operates next day.

With regard to this, as well as to all other resinous purges, it ought to be observed, that when they are given in substance without any mixture, they are apt to adhere to the coats of the intestines, and to occasion griping and uneasiness; for these reasons aloes are generally mixed with some saponaceous or resolvent body, to destroy its viscid tenacity, before it is given in substance. The substances which are most used for this purpose are, a small quantity of the fixed alkaline salts; soap; the yolk of an egg; and gummous vegetable extracts. Mr Barton alleges*, that by triturating aloes with a small quantity of alkaline salts, its tenacity was more effectually destroyed than by any other thing he tried: that Castile soap and the yolk of an egg answered best, next to it: that manna, sugar, and honey, were far inferior to them; and that gummous, or mucous vegetable extracts, such as the extracts of gentian, or of liquorice root, triturated with the aloes, in the proportion of one part of the extract to two of the aloes, and then made up into pills with a sufficient quantity of syrup, destroyed the viscidity of the aloes, and rendered its operation mild.

* *Treatise of the Manufacture of Drugs*, 1747.

Socotorine aloes contains more gummy matter than the hepatic; and hence it is likewise found to purge more and with greater irritation. The first sort therefore is most proper where a stimulus is required, as for promoting or exciting the menstrual flux; whilst the latter is better calculated to act as a common purge. For the aloetic preparations, see PHARMACY-*Index*.

Aloes-Wood. See *Xylo-Aloes*.

American Aloe. See Agave.

ALOGIANS, in church-history, a sect of ancient heretics, who denied that Jesus Christ was the Logos, and consequently rejected the gospel of St John—The word is compounded to the primitive α and λογος, q. d. *without Logos* or *Word*.—Some ascribe the origin of the name, as well as of the sect of Alogians, to Theodore of Byzantium, by trade a currier; who having apostatized under the prosecution of the emperor Severus, to defend himself against those who reproached him therewith, said, that it was not God he denied, but only man. Whence his followers were called in Greek αλογοι, because they rejected the Word. But others, with more probability, suppose the name to have been first given them by Epiphanius in the way of reproach. They made their appearance toward the close of the second century.

ALOGOTROPHIA, among physicians, a term signifying the unequal growth or nourishment of any part of the body, as in the rickets.

ALOOF, has frequently been mentioned as a sea-term; but whether justly or not, we shall not presume to determine. It is known in common discourse to imply *at a distance*; and the resemblance of the phrase *keep a loof*, and *keep a luff* or *keep the luff*, in all probability gave rise to this conjecture. If it was really a sea-phrase originally, it seems to have referred to the dangers of a lee-shore, in which situation the pilot might naturally apply it in the sense commonly understood, viz. keep *all off*, or quite off: it is, however, never expressed in that

that manner by feamen now. See Luff. It may not be improper to obferve, that befides ufing this phrafe in the fame fenfe with us, the French alfo call the weather-fide of a fhip, and the weather-clue of a courfe, *le lof*.

ALOPECE, Alopecia (anc. geog.), an ifland placed by Ptolemy at the mouth of the Tanais, and called the ifland *Tanais*: now *l'Ifle des Renards* (Baudrand). Alfo an ifland of the Bofphorus Cimmerius (Pliny); and another in the Egean fea, over-againft Smyrna.

ALOPECIA, a term ufed among phyficians to denote a total falling off of the hair from certain parts, occafioned either by the defect of nutritious juice, or by its vicious quality corroding the roots of it, and leaving the fkin rough and colourlefs.

The word is formed from αλωπηξ, *vulpes*, "a fox;" whofe urine, it is faid, will occafion baldnefs; or becaufe it is a difeafe which is common to that creature. It is directed to wafh the head every night at going to bed with a ley prepared by boiling the afhes of vine branches in red wine. A powder made by reducing hermodactyls to fine flour, is alfo recommended for the fame purpofe.

In cafes where the baldnefs is total, a quantity of the fineft burdock roots are to be bruifed in a marble mortar, and then boiled in white wine until there remains only as much as will cover them. This liquor, carefully ftrained off, is faid to cure baldnefs, by wafhing the head every night with fome of it warm. A ley made by boiling afhes of vine branches in common water, is alfo recommended with this intention. A frefh cut onion, rubbed on the part until it be red and itch, is likewife faid to cure baldnefs.

A multitude of fuch remedies are every where to be found in the works of Valefcus de Taranta, Rondeletius, Hollerius, Trincavellius, Celfus, Senertay, and other practical phyficians. See alfo Buxus.

ALOPECURUS, or Fox-tail grass, in botany: A genus of the triandria digynia clafs; and in the natural method ranking under the 4th order, *Gramina*. The characters are: The *calyx* is a fingle flowered bivalve glume: The *corolla* is one-valved: The *ftamina* confift of three capillary filaments; the antheræ bifurcated at both ends: The *piftillum* is a roundifh germen: there are two ftyli; and the ftigmata are fimple: The *pericarpium* is a corolla cloathing the feed; and the *feed* is fingle and roundifh. There are eight fpecies, viz. the pratenfis, or meadow fox-tail grafs; the bulbofus, or bulbous fox-tail grafs; the geniculatus, or flote fox-tail grafs; and the myofuroides, or field fox-tail grafs; thefe four grow wild in Britain: the agreftis, the monfpelienfis, the paniceus, and the hordeiformis, are all natives of France and the fouthern parts of Europe, except the laft, which is a native of India. See Grass.

ALOPEX, in zoology, a fpecies of the canis, with a ftrait tail and black tip. It is commonly called the *field fox*.

ALOSA, the fhad, or mother of herrings, a fpecies of the clupea. See Clupea.

ALOST, a town in Flanders, belonging to the houfe of Auftria, feated on the river Dender, in the midway between Bruffels and Ghent. It has but one parifh; but the church is collegiate, and has a provoft, a dean, and twelve canons. Here is a convent of Carmelites, another of capuchins, another of bare-footed Carmelites, three nunneries, an hofpital, and a convent of Guillemins, in which is the tomb of Theodore Martin, who brought the art of printing out of Germany into the Low Countries. He was a friend of Erafmus, who wrote his epitaph. E. Long. 4. 10. N. Lat. 49. 55.

ALPHA, the name of the firft letter of the Greek alphabet, anfwering to our A,—As a numeral, it ftands for one, or the firft of any thing. It is particularly ufed, among ancient writers, to denote the chief or firft man of his clafs or rank. In this fenfe, the word ftands contradiftinguifhed from *beta*, which denotes the fecond perfon. Plato was called the *Alpha* of the wits: Eratofthenes, keeper of the Alexandrian library, whom fome called a Second Plato, is frequently named *Beta*.

Alpha is alfo ufed to denote the beginning of any thing. In which fenfe it ftands oppofed to *omega*, which denotes the end. And thefe two letters were made the fymbol of Chriftianity; and accordingly were engraven on the tombs of the ancient Chriftians, to diftinguifh them from thofe of idolaters. Moralez, a Spanifh writer, imagined that this cuftom only commenced fince the rife of Arianifm; and that it was peculiar to the orthodox, who hereby made confeffion of the eternity of Chrift: but there are tombs prior to the age of Conftantine whereon the two letters were found, befides that the emperor juft mentioned bore them on his labarum before Arius appeared.

ALPHABET, the natural or cuftomary feries of the feveral letters of a language (fee Language and Writing). The word is formed from *alpha* and *beta*, the firft and fecond letters of the Greek alphabet. The number of letters is different in the alphabets of different languages. The Englifh alphabet contains 24 letters; to which if we add *j* and *v* confonant, the fum will be 26: the French contains 23; the Hebrew, Chaldee, Syriac, and Samaritan, 22 each; the Arabic 28; the Perfian 31; the Turkifh 33; the Georgian 36; the Coptic 32; the Mufcovite 43; the Greek 24; the Latin 22; the Scalvonic 27; the Dutch 26; the Spanifh 27; the Italian 20; the Ethiopic and Tartarian, each 202; the Indians of Bengal 21; the Baramefe 19. The Chinefe have, properly fpeaking, no alphabet, except we call their whole language by that name; their letters are words, or rather hieroglyphics, amounting to about 80,000.

It has been a matter of confiderable difpute whether the method of expreffing our ideas by vifible fymbols, called *letters*, be really a human invention; or whether we ought to attribute an art fo exceedingly ufeful, to an immediate revelation from the Deity.—In favour of the latter opinion it has been urged,

1 Arguments for writing being a divine revelation.

1. The five books of Mofes are univerfally acknowledged to be the moft ancient compofitions as well as the moft early fpecimens of alphabetical writing we have. If, therefore, we fuppofe writing to be the refult of human ingenuity, it muft be different from all other arts, having been brought to perfection at once; as it feems impoffible to make any real improvement on the Hebrew alphabet. It may indeed be replied, that alphabetical characters perhaps have exifted many ages before the writings of Mofes, though the more ancient fpecimens have perifhed. This, however, being a mere

mere unsupported assertion, without any historical testimony to corroborate it, cannot be admitted as a proof. Again, setting aside the evidence to be derived from Scripture on this subject, the simplicity of manners predominant in the early ages, the small extent of the intellectual powers of mankind, and the little intercourse which nations had with one another, which would seem more particularly to render writing necessary, can scarce allow us to suppose that such a complex and curious contrivance as alphabetical writing could be invented by a race of men whose wants were so few, their advantages so circumscribed, and their ideas so limited.

2. If alphabetical writing were a mere human invention, it might be expected that different nations would have fallen upon the same expedient independent of each other during the compass of so many ages. But no such thing has taken place; and the writing of every people on earth may be referred to one common original. If this can be proved, the argument from successive derivation, without a single instance of independent discovery, must be allowed to amount to the very highest degree of probability in favour of our hypothesis, which will now rest on the evidence for or against this fact; and which may be summed up in the following manner.

Among the European nations we find none who can pretend any right to the discovery of letters. All of them derived the art from the Romans, excepting only the Turks, who had it from the Arabians. The Romans never laid claim to the discovery; but confessed that they derived their knowledge from the Greeks, and the latter owned that they had it from the Phœnicians; who, as well as their colonists the Carthaginians, spoke a dialect of the Hebrew scarcely varying from the original. The Coptic, or Egyptian, resembles the Greek in most of its characters, and is therefore to be referred to the same original. The Chaldee, Syriac, and latter Samaritan, are dialects of the Hebrew, without any considerable deviation, or many additional words. The Ethiopic differs more from the Hebrew, but less than the Arabic; yet these languages have all issued from the same stock, as the similiarity of their formation, and the numberless words common to them, all sufficiently evince; and the Persic is very nearly allied to the Arabic. Alterations indeed would naturally be produced, in proportion to the civilization of the several nations, and their intercourse with others; which will account for the superior copiousness of some above the rest. It appears then, that all the languages in use amongst men that have been conveyed in alphabetical characters, have been the languages of people connected ultimately or immediately with the Hebrews, who have handed down the earliest specimens of writing to posterity; and we have therefore the greatest reason to believe, that their method of writing, as well as their language, was derived from the same source.

This proposition will be farther confirmed from considering the sameness of the artificial denominations of the letters in the Oriental, Greek, and Latin languages, accompanied also by a similar arrangement, as *alpha*, *beta*, &c. It may still be objected, however, that the characters employed by the ancients to discriminate their letters are entirely dissimilar. Why should not one nation, it may be urged, adopt from the other the mode of expressing the art as well as the art itself? To what purpose did they take the trouble of inventing other characters? To this objection it may be replied, 1. From the instance of our own language we know what diversities may be introduced in this respect merely by length of time and an intercourse with neighbouring nations. And such an effect would be more likely to take place before the art of printing had contributed to establish an uniformity of character: For when every work was transcribed by the hand, we may easily imagine how many variations would arise from the fancy of the scribe, and the mode of writing so constantly different in individuals. 2. This diversity might sometimes arise from vanity. When an individual of another community had become acquainted with this wonderful art, he might endeavour to recommend himself as the inventor; and, to avoid detection, might invent other characters. 3. The characters of the alphabet might sometimes be accommodated as much as possible to the symbolical marks already in use amongst a particular people. These having acquired a high degree of sanctity by the use of many generations, would not be easily superseded without the aid of some such contrivance. 4. This is supported by the testimony of Herodotus; who informs us, that "those Phœnicians who came with Cadmus introduced many improvements among the Greeks, and alphabetical writing too, not known among them before that period. At first they used the Phœnician character; but in process of time, as the pronunciation altered, the standard of the letters was also changed. The Ionian Greeks inhabited at that time the parts adjacent to Phœnicia; who having received the art of alphabetical writing from the Phœnicians, used it, with an alteration of some few characters, and confessed ingenuously, that it was called Phœnician from the introducers of it." He tells us that he had himself seen the characters of Cadmus in a temple of Ismenian Apollo at Thebes in Bœotia, engraven upon tripods, and very much resembling the Ionian characters. 5. The old Samaritan is precisely the same as the Hebrew language; and the Samaritan Pentateuch does not vary by a single letter in twenty words from the Hebrew: but the characters are widely different: for the Jews adopted the Chaldaic letters during their captivity at Babylon, instead of the characters of their forefathers.

3. What we know of those nations who have continued for many centuries unconnected with the rest of the world, strongly militates against the hypothesis of the human invention of alphabetical writing. The experiment has been fairly made upon the ingenuity of mankind for a longer period than that which is supposed to have produced alphabetical writing by regular gradations; and this experiment determines peremptorily in their favour. The Chinese, a people famous for their discoveries and mechanical turn of genius, have made some advances towards the delineation of their ideas by arbitrary signs; but have nevertheless been unable to accomplish this exquisite device; and after so long a trial to no purpose, we may reasonably infer, that their mode of writing, which is growing more intricate and voluminous every day, would never terminate in so clear, so comparatively simple,

Alphabet. simple, an expedient as that of alphabetical characters. The Mexicans, too, had made some rude attempts of the same kind; but with less success than the Chinese. We know also, that hieroglyphics were in use among the Egyptians posterior to the practice of alphabetical writing by the Jews; but whether the epistolography, as it is called, of the former people, which was in vogue during the continuance of the hieroglyphics, might not possibly be another name for alphabetical writing, cannot be decided.

4. We shall consider the argument on which the commonly received supposition entirely depends: that is, the natural gradation through the several species of symbols acknowledged to have been in use with various people, terminating at last by an easy transition, in the detection of alphabetical characters. The strength of this argument will be best understood from the following representation.

"1. The first method of embodying ideas would be by drawing a representation of the objects themselves. The imperfection of this method is very obvious, both on account of its tediousness and its inability of going beyond external appearances to the abstract ideas of the mind.

"2. The next method would be somewhat more general, and would substitute two or three principal circumstances for the whole transaction. So two kings, for example, engaging each other with military weapons, might serve to convey the idea of a war between the two nations. This abbreviated method would be more expeditious than the former; but what it gained in conciseness would be lost in perspicuity. It is a description more compendious indeed, but still a description of outward objects alone, by drawing their resemblance. To this head may be referred the picture-writing of the Mexicans.

"3. The next advance would be to the use of symbols: the incorporation, as it were, of abstract and complex ideas in figures more or less generalized, in proportion to the improvement of it. Thus, in the earlier stages of this device, a circle might serve to express the sun, a semicircle the moon; which is only a contraction of the foregoing method. This symbol-writing in its advanced state would become more refined, but enigmatical and mysterious in proportion to its refinement. Hence it would become less fit for common use, and therefore more particularly appropriated to the mysteries of philosophy and religion. Thus, two feet standing upon water served to express an impossibility; a serpent denoted the oblique trajectories of the heavenly bodies; and the beetle, on account of some supposed properties of that insect, served to represent the sun. The Egyptian hieroglyphics were of this kind.

"4. This method being still too subtile and complicated for common use, the only plan to be pursued was a reduction of the first stage of the preceding method. Thus a dot, instead of a circle, might stand for the sun; and a similar abbreviation might be extended to all the symbols. On this scheme every object and idea would have its appropriated mark: these marks therefore would have a multiplicity proportionable to the works of nature and the operations of the mind. This method was likewise practised by the Egyptians; but has been carried to greater perfection by the Chinese. The vocabulary of the latter is therefore infinite, or at least capable of being extended to any imaginable length. But if we compare this tedious and aukward contrivance with the astonishing brevity and perspicuity of alphabetical writing, we must be persuaded that no two things can be more dissimilar; and that the transition from a scheme constantly enlarging itself, and growing daily more intricate, to the expression of every possible idea by the modified arrangement of four-and-twenty marks, is not so very easy and perceptible as some have imagined. Indeed this seems still to be rather an expression of things in a manner similar to the second stage of symbol-writing than the notification of ideas by arbitrary signs."

2 Additional remarks in confirmation of these arguments.

To all this we shall subjoin the following remarks, which seem to give additional force to the foregoing reasoning.

"1. Pliny asserts the use of letters to have been eternal; which shows the antiquity of the practice to extend beyond the æra of authentic history.

"2. The cabalistical doctors of the Jews maintain, that alphabetical writing was one of the ten things which God created on the evening of the Sabbath.

"3. Most of the profane authors of antiquity ascribe the first use of alphabetical characters to the Egyptians; who, according to some, received them from Mercury; and, according to others, from their god Teuth.

"4. There is very little reason to suppose that even language itself is the effect of human ingenuity and invention."

3 Answers to the above arguments.

Thus we have stated the arguments in favour of the revelation of alphabetical writing; which are answered, by those who take the contrary side, in the following manner.

1. Moses no where says that the alphabet was a new thing in his time; nor does he give the least hint of his being the inventor of it. The first mention we find of *writing* is in the 17th chapter of Exodus; where Moses is commanded to *write in a book*; and which took place before the arrival of the Israelites at Sinai. This shows that writing did not commence with the delivery of the two tables of the law, as some have supposed. Neither are we to conclude that the invention had taken place only a short time before; for the *writing in a book*, is commanded as a thing commonly understood, and with which Moses was well acquainted. It is plain, from the command to engrave the names of the twelve tribes of Israel upon stones *like the engravings of a signet*, that writing had been known and practised among them, as well as other nations, long before. We must also remember, that the people were commanded to write the law on their door-posts, &c. so that the art seems not only to have been known, but universally practised among them. But had writing been a new discovery in the time of Moses, he would probably have commemorated it as well as the other inventions of music, &c. Nor is there any reason to suppose that God was the immediate revealer of the art; for Moses would never have omitted to record a circumstance of such importance, as the memory of it would have been one of the strongest barriers against idolatry.

Again, though several profane writers attribute the origin of letters to the gods, or to some divine person, yet this is no proof of its being actually revealed; but only that the original inventor was unknown. The learned bishop of Gloucester observes, that the ancients gave nothing to the gods of whose original they had any records; but where the memory of the invention was lost, as of seed-corn, wine, writing, civil society, &c. the gods seized the property, by that kind of right which gives strays to the lord of the manor.

As neither the sacred nor profane historians, therefore, have determined any thing concerning the invention of letters, we are at liberty to form what conjectures we think most plausible concerning the origin of them; and this, it is thought, might have taken place in the following manner.

"1. Men in their rude uncultivated state, would have neither leisure, inclination, nor inducement, to cultivate the powers of the mind to a degree sufficient for the formation of an alphabet: but when a people arrived at such a pitch of civilization as required them to represent the conceptions of the mind which have no corporeal forms, necessity would occasion further exertions, and urge them to find out a more expeditious manner of transacting their business than by picture writing.

"2. These exertions would take place whenever a nation began to improve in arts, manufactures, and commerce; and the greater genius such a nation had, the more improvements would be made in the notation of their language; whilst those people who had made less progress in civilization and science, would have a less perfect system of elementary characters; and perhaps advance no farther for many ages than the marks or characters of the Chinese. Hence we may see, that the business of princes, as well as the manufactures and commerce of each country, would produce the necessity of devising some expeditious manner of communicating information to one another."

The art of writing, however, is of so great antiquity, and the early history of most nations so full of fable, that it must be extremely difficult to determine what nation or people may justly claim the honour of the invention. But as it is probable that letters were the produce of a certain degree of civilization among mankind, we must therefore have recourse to the history of those nations who seem to have been first civilized.

4 Claim of the Egyptians to the invention of letters.

The Egyptians have an undoubted title to a very early civilization; and many learned men have attributed the invention of letters to them. The late bishop of Gloucester contends, that Egypt was the parent of all the learning of Greece, and was resorted to by all the Grecian legislators, naturalists, and philosophers; and endeavours to prove that it was one of the first civilized countries on the globe. Their writing was of four kinds: 1. *Hieroglyphic*; 2. *Symbolic*; 3. *Epistolic*; and, 4. *Hierogrammatic*. In the most early ages they wrote like all other infant nations, by pictures; of which some traces yet remain amongst the hieroglyphics of Horapollo, who informs us, that they represented a *fuller* by a man's two feet in water; *fire*, by smoke ascending, &c. But to render this rude invention less incommodious, they soon devised the method of putting one thing of similar qualities for another. The former was called the *curiologic*, the latter the *tropical* hieroglyphic; which last was a gradual improvement on the former. These alterations in the manner of delineating hieroglyphic figures produced and perfected another character, called the *running-hand of the hieroglyphics*, resembling the Chinese writing; which having been first formed by the outlines of each figure, became at length a kind of *marks*; the natural effects of which were, that the constant use of them would take off the attention from the symbol and fix it on the thing signified. Thus the study of symbolic writing would be much abbreviated; because the writer or decypherer would then have little to do but to remember the power of the symbolic mark; whereas before, the properties of the thing or animal delineated were to be learned. This, together with the other marks by institution, to denote mental conceptions, would reduce the characters to a similar state with the present Chinese; and these were properly what the ancients called *hieroglyphical*. We are informed by Dr Robert Huntingdon, in his account of the Porphyry pillars, that there are some ancient monuments of this kind yet remaining in Egypt.

The sacred book or ritual of the Egyptians, according to Apuleius, was written partly in symbolic and partly in these hieroglyphic characters, in the following manner: "He (the hierophant) drew out certain books from the secret repositories of the sanctuary, written in unknown characters, which contained the words of the sacred formula compendiously expressed, partly by figures of animals, and partly by certain marks or notes intricately knotted, revolving in the manner of a wheel, crowded together, and curled inward like the tendrils of a vine, so as to hide the meaning from the curiosity of the profane."

5 Letters not invented in Egypt.

But though letters were of great antiquity in Egypt, there is reason to believe that they were not first invented in that country. Mr Jackson, in his Chronological Antiquities, has endeavoured to prove, that they were not invented or carried into Egypt by *Taaut* or *Thoth*, the first Hermes, and son of Misraim, who lived about 500 years after the deluge; but that they were introduced into that country by the second Hermes, who lived about 400 after the former. This second Hermes, according to Diodorus, was the inventor of grammar and music, and added many words to the Egyptian language. According to the same author also, he invented letters, rythm, and the harmony of sounds. This was the Hermes so much celebrated by the Greeks, who knew no other than himself. On the other hand, Mr Wise asserts that Moses and Cadmus could not learn the alphabet in Egypt; and that the Egyptians had no alphabet in their time. He adduces several reasons to prove that they had none till they received what is called the *Coptic*, which was introduced either in the time of the Ptolemies or under Psammitichus or Amasis; and the oldest alphabetic letters which can be produced as Egyptian, appear plainly to have been derived from the Greek. Herodotus confesses, that all he relates before the reign of Psammitichus is uncertain; and that he reports the early transactions of that nation on the credit of the Egyptian priests, on which he did not greatly depend; and Diodorus Siculus is said to have been greatly imposed upon by them. Manetho, the oldest Egyptian historian, translated tranflated the facred regifters out of Egyptian into Greek, which are faid by Syncellus to have been written in the facred letters, and to have been laid up by the fecond Mercury in the Egyptian temples. He allows the Egyptian gods to have been mortal men: but his hiftory was very much corrupted by the Greeks, and hath been called in queftion by feveral writers from the account which he himfelf gave of it. After Cambyfes had carried away the Egyptian records, the priefts, to fupply their lofs, and to keep up their pretenfions to antiquity, began to write new records; wherein they not only unavoidably made great miftakes, but added much of their own invention, efpecially as to diftant times.

6 Claim of the Phœnicians,

The Phoenicians have likewife been fuppofed the inventors of letters; and we have the ftrongeft proofs of the early civilization of this people. Their moft ancient hiftorian, Sanchoniatho, lived in the time of Abibalus, father of Hiram king of Tyre. He informs us, that letters were invented by *Taaut*, who lived in Phoenicia in the 12th and 13th generations after the creation. "Mifor (fays he) was the fon of Hamyn; the fon of Mifor was *Taaut*, who invented the firft letters for writing." The Egyptians call him *Thoth*; the Alexandrians *Thoyth*; and the Greeks *Hermes*, or *Mercury*. In the time of this Taaut or Mercury (the grandfon of Ham the fon of Noah), Phoenicia and the adjacent country was governed by Uranus, and after him by his fon Saturn or Cronus. He invented letters either in the reign of Uranus or Cronus; and ftaid in Phoenicia with Cronus till the 32d year of his reign. Cronus, after the death of his father Uranus, made feveral fettlements of his family, and traverfed into other parts; and when he came to the fouth country, he gave all Egypt to the god Tarutus, that it fhould be his kingdom. Sanchoniatho began his hiftory with the creation, and ended ft with placing Taautus on the throne of Egypt. He does not mention the deluge, but makes two more generations in Cain's line from Protagonus to Agrovenus (or from Adam to Noah) than Mofes. As Sanchoniatho has not told us whether Taaut invented letters either in the reign of Uranus or Cronus, "we cannot err much (fays Mr Jackfon) if we place his invention of them 550 years after the flood, or 20 years after the difperfion, and 2619 years before the Chriftian æra, and fix, or perhaps ten years, before he went into Egypt." This prince and his pofterity reigned at Thebes in Upper Egypt for 15 generations.

Several Roman authors attribute the invention of letters to the Phoenicians. Pliny fays (A), the Phoenicians were famed for the invention of letters, as well as for aftronomical obfervations and novel and martial arts. Curtius informs us, that the Tyrian nation are related to be the firft who either taught or learned letters; and Lucan fays, that they were the firft who attempted to exprefs founds or words by letters. Eufebius alfo tells us from Porphyry, that "Sanchoniatho ftudied with great application the writings of Taaut, knowing that he was the firft who invented letters."

The Greeks, as we have already obferved, knew no older Hermes than the fecond, who lived about 400 years after the Mezrite Taaut or Hermes. This fecond Hermes is called by Plato *Theuth*, and counfellor or facred fcribe to king Thanius; but it is not faid that he ever reigned in Egypt: but the former Taaut, or Athothes, as Manetho calls him, was the immediate fucceffor of Menes the firft king of Egypt. This fecond Mercury, if we may believe Manetho, compofed feveral books of the Egyptian hiftory; and having improved both the language and letters of that nation, the Egyptians attributed the arts and inventions of the former to the latter. The Phoenician language is generally allowed to have been a dialect of the Hebrew; and tho' their alphabet does not entirely agree with the Samaritan, yet there is a great fimilarity between them. Aftronomy and arithmetic were much cultivated among them in the moft early ages: their fine linen, purple, and glafs, were much fuperior to thofe of other nations; and their extraordinary fkill in architecture and other arts was fuch, that whatever was great, elegant, or pleafing, whether in buildings, apparel, or toys, was diftinguifhed by the epithet of Tyrian or Sidonian; thefe being the chief cities of Phoenicia. Their great proficiency in learning and arts of all kinds, together with their engroffing all the commerce of the weftern world, are likewife thought to give them a juft claim to the invention of letters.

7 Of the Chaldeans.

The Chaldeans alfo have laid claim to the invention of letters; and with regard to this, there is a tradition among the Jews, Indians, and Arabians, that the Egyptians derived their knowledge from Abraham, who was a Chaldean. This tradition is in fome degree confirmed by moft of the weftern writers, who afcribe the inventions of arithmetic and aftronomy to the Chaldeans. Jofephus pofitively afferts, that the Egyptians were ignorant of the fciences of arithmetic and aftronomy before they were inftructed by Abraham; and Sir Ifaac Newton admits, that letters were known in the line of that patriarch for many centuries before Mofes. The Chaldaic letters appear to have been derived from the Hebrew or Samaritan; which are the fame, or nearly fo, with the old Phoenician. Ezra is fuppofed to have exchanged the old Hebrew characters for the more beautiful and commodious Chaldee, which are ftill in ufe. Berofus, the moft ancient Chaldean hiftorian, who was born in the minority of Alexander the Great, does not fay that he believed his countrymen to have been the inventors of letters.

8 Of the Syrians.

The Syrians have alfo laid claim to the invention of letters. It is certain, indeed, that they yielded to no nation in knowledge and fkill in the fine arts. Their language is faid to have been the vernacular of all the oriental tongues, and was divided into three dialects. 1. The Aramean, ufed in Mefopotamia, and by the inhabitants of Roha and Edefa of Harram, and the Outer Syria. 2. The dialect of Paleftine; fpoken by the inhabitants of Damafcus, Mount Libanus, and the Inner Syria. 3. The Chaldee or Nabathean dialect, the moft unpolifhed of the three; and fpoken in the mountainous parts of Affyria, and the villages of Irac

(A) See above, n° 2. where he fays that the knowledge of letters was eternal. What dependence can we put in the teftimony of fuch a writer?

Irac or Babylonia. It has been generally believed, that no nation of equal antiquity had a more considerable trade than the Syrians: they are supposed to have first brought the commodities of Persia and India into the west of Asia; and they seem to have carried on an inland trade by engrossing the navigation of the Euphrates, whilst the Phœnicians traded to the most distant countries. Notwithstanding these circumstances, however, which might seem to favour the claim of the Syrians, the oldest characters they have are but about three centuries before Christ. Their letters are of two sorts. 1. The Estrangelo, which is the more ancient; and, 2. The Fshito, the simple or common character, which is the more expeditious and beautiful.

9 Of the Indians.

We must next examine the claims of the Indians, whose pretensions to antiquity yield to no other nation on earth. Mr Halhed, who has written a grammar of the Shanscrit language, informs us, that it is not only the grand source of Indian literature, but the parent of almost every dialect from the Persian gulph to the Chinese seas, and which is said to be a language of the most venerable antiquity. At present it is appropriated to the religious records of the Bramins, and therefore shut in their libraries; but formerly it appears to have been current over the greatest part of the eastern world, as traces of its extent may be found in almost every district of Asia.

Mr Halhed informs us, that "there is a great similarity between the Shanscrit words and those of the Persian and Arabic, and even of Latin and Greek; and these not in technical or metaphorical terms, but in the main ground-works of language; in monosyllables, the names of numbers, and the appellations of such things as would be first discriminated on the immediate dawn of civilization. The resemblance which may be seen of the characters on the medals and signets of different parts of Asia, the light they reciprocally throw upon one another, and the general analogy which they all bear to the grand prototype, affords another ample field for curiosity. The coins of Assam, Napaul, Cashmiria, and many other kingdoms, are all stamped with Shanscrit letters, and mostly contain allusions to the old Shanscrit mythology. The same conformity may be observed in the impressions of seals from Bootan and Thibet."

The country between the Indus and Ganges still preserves the Shanscrit language in its original purity, and offers a great number of books to the perusal of the curious; many of which have been handed down from the earliest periods of human tradition.

There are seven different sorts of Indian hand-writings, all comprised under the general term of *Naagoree*, which may be interpreted *writing*. The Bramins say that letters were of divine original; and the elegant Shanscrit is styled *Daeb-naagoree*, or the writings of the Immortals, which might not improbably be a refinement from the more simple *Naagoree* of former ages. The Bengal letters are another branch of the same stock. The Bramins of Bengal have all their Shanscrit books copied in their national alphabet, and they transcribe into them all the Daeb-naagoree manuscripts for their own perusal. The Moorish dialect is that species of Hindostanic which we owe to the conquests of the Mahometans.

The Shanscrit language contains about 700 radical words; the fundamental part being being divided into three classes, viz. 1. *Dhaat*, or roots of verbs; 2. *Shubd*, or original nouns; 3. *Evya*, or particles. Their alphabet contains 50 letters; viz. 34 consonants and 16 vowels. They assert that they were in possession of letters before any other nation in the world: and Mr Halhed conjectures, that the long-boasted original civilization of the Egyptians may still be a matter of dispute. The Rajah of Kishinagur affirms, that he has in his possession Shanscrit books, where the Egyptians are constantly described as disciples, not as instructors; and as seeking in Hindostan that liberal education, and those sciences, which none of their own countrymen had sufficient knowledge to impart. Mr Halhed hints also, that the learning of Hindostan might have been transplanted into Egypt, and thus have become familiar to Moses. Several authors, however, are of opinion, that the ancient Egyptians possessed themselves of the trade of the East by the Red Sea, and that they carried on a considerable traffic with the Indian nations before the time of Sesostris; whom they suppose to have been cotemporary with Abraham, though Sir Isaac Newton conjectures him to have been the Shishak who took Jerusalem in the time of Rehoboam.

In the year 1769, one of the sacred books of the Gentoos called *Bagavadam*, translated by Meridas Poule, a learned man of Indian origin, and chief interpreter to the supreme council of Pondicherry, was sent by him to M. Bertin in France. In his preface he says, that it was composed by Viasser the son of Brahma, and is of sacred authority among the worshippers of Vischnow. This book claims an antiquity of 5000 years; but M. de Guines has shown, that its pretensions to such extravagant antiquity are entirely inconclusive and unsatisfactory: whence we may conclude, says Mr Astle, that though a farther inquiry into the literature of the Indian nations may be laudable, yet we must by no means give too easy credit to their relations concerning the high antiquity of their manuscripts and early civilization.

10 Letters not invented in Persia;

It is not pretended that the Persians had any great learning among them till the time of Hystaspes the father of Darius. The former, we are told, travelled into India, and was instructed by the Bramins in the sciences for which they were famed at that time. The ancient Persians despised riches and commerce, nor had they any money among them till after the conquest of Lydia. It appears by several inscriptions taken from the ruins of the palace of Persepolis, which was built near 700 years before the Christian æra, that the Persians sometimes wrote in perpendicular columns like the Chinese. This mode of writing was first made use of on the stems of trees, pillars, or obelisks. As for those simple characters found on the west side of the stair-case of Persepolis, some have supposed them to be alphabetic, some hieroglyphic, and others antediluvian. Dr Hyde pronounces them to have been mere whimsical ornaments, though the author of Conjectural Observations on Alphabetic Writing supposes them to be fragments of Egyptian antiquity brought by Cambyses from the spoils of Thebes. The learned are generally agreed, that the Persians were later in civilization than many of their neighbours; and they are not supposed to have any pretensions to the invention of letters.

As the Arabians have been in possession of the country

try they now inhabit for upwards of 3700 years, without being intermixed with foreign nations, or subjugated by any other power, their language must be very ancient. The two principal dialects of it were that spoken by the Hamyarites and other genuine Arabs; and that of the Koreish, in which Mahomet wrote the Alcoran. The former is named by oriental writers *the Arabic of Hamyar;* the latter, *the pure*, or *defecated Arabic*. Mr Richardson observes, as a proof of the richness of this language, that it consists of 2000 radical words.

11 Nor by the Arabians.

The old Arabic characters are said to have been of very high antiquity; for Ebn Hashem relates, that an inscription in it was found in Yaman as old as the days of Joseph. Hence some have supposed that the Arabians were the inventors of letters; and Sir Isaac Newton is of opinion, that Moses learned the alphabet from the Midianites, who were Arabians.

The alphabet of the Arabs consists of 28 letters similar to the ancient Cufic, in which the first copies of the Alcoran were written. The present Arabic characters were formed by Ebn Moklah, a learned Arabian, who lived about 300 years after Mahomet. The Arabian writers themselves inform us, that their alphabet is not very ancient, and that they received it only a short time before the introduction of Islamism.

On this account of the pretensions of different nations to the invention of letters, Mr Astle makes the following reflections. "The vanity of each nation induces them to pretend to the most early civilization; but such is the uncertainty of ancient history, that it is difficult to determine to whom the honour is due. It should seem, however, that the contest may be confined to the Egyptians, the Phœnicians, and the Chaldeans. The Greek writers, and most of those who have copied them, decide in favour of Egypt, because their information is derived from the Egyptians themselves. The positive claim of the Phœnicians does not depend entirely upon the testimony of Sanchoniatho; the credit of his history is so well supported by Philo of Byblus his translator, Porphyry, Pliny, Curtius, Lucan, and other ancient writers, who might have seen his works entire, and whose relations deserve at least as much credit as those of the Egyptian and Greek writers. It must be allowed, that Sanchoniatho's history contains many fabulous accounts; but does not the ancient history of the Egyptians, the Greeks, and most other nations, abound with them to a much greater degree? The fragments which we have of this most ancient historian are chiefly furnished by Eusebius, who took all possible advantages to represent the Pagan writers in the worst light, and to render their theology absurd and ridiculous.

12 Letters most probably invented in Phœnicia.

"The Phœnician and Egyptian languages are very similar; but the latter is said to be more large and full, which is an indication of its being of a later date. The opinion of Mr Wise, however, that the ancient Egyptians had not the knowledge of letters seems to be erroneous; as they had commercial intercourse with their neighbours the Phœnicians, they probably had the knowledge of letters, if their policy, like that of the Chinese at this day, did not prohibit the use of them.

"The Chaldeans, who cultivated astronomy in the most remote ages, used symbols or arbitrary marks in their calculations; and we have shown, that these were the parents of letters. This circumstance greatly favours their claim to the invention; because Chaldea, and the countries adjacent, are allowed by all authors both sacred and profane, to have been peopled before Egypt; and it is certain that many nations said to be descended from Shem and Japhet, had their letters from the Phœnicians, who were descended from Ham.

"It is observable, that the Chaldeans, the Syrians, Phœnicians and Egyptians, all bordered upon each other; and as the Phœnicians, were the greatest as well the most ancient commercial nation, it is very probable that they communicated letters to the Egyptians, the ports of Tyre and Sidon being not far distant from each other.

"Mr Jackson is evidently mistaken when he says, that letters were invented 2619 years before the birth of Christ. The deluge recorded by Moses was 2349 years before that event: and if letters were not invented till 550 years after, as he asserts, we must date their discovery only 1799 years before the Christian æra, which is 410 years after the reign of Menes the first king of Egypt, who, according to Syncellus and others, is said to have been the same person with the Misor of Sanchoniatho, the Mizraim of the Scriptures and the Osiris of the Egyptians: but whether this be true or not, Egypt is frequently called in Scripture *the land of Mizraim*.

"This Mizraim, the second son of Amyn or Ham seated himself near the entrance of Egypt at Zoan, in the year before Christ 2188, and 160 years after the flood. He afterwards built Thebes, and some say, Memphis. Before the time that he went into Egypt, his son Taaut had invented letters in Phœnicia; and if this invention took place ten years before the migration of his father into Egypt, as Mr Jackson supposes, we may trace letters as far back as the year 2172 before Christ, or 150 years after the deluge recorded by Moses: and beyond this period, the written annals of mankind, which have been hitherto transmitted to us, will not enable us to trace the knowledge of them; though this want of materials is no proof that letters were not known until a century and an half after the deluge. As for the pretensions of the Indian nations we must be better acquainted with their records before we can admit of their claim to the first use of letters; especially as none of their manuscripts of any great antiquity have as yet appeared in Europe. That the Arabians were not the inventors of letters, has appeared by their own confession.—Plato somewhere mentions Hyperborean letters very different from the Greek; these might have been the characters used by the Tartars or ancient Scythians.

13 Of antediluvian writing.

"It may be expected that something should be said concerning those books mentioned by some authors to have been written before the deluge. Amongst others, Dr Parsons, in his Remains of Japhet, p. 346. 359. supposes letters to have been known to Adam; and the Sabeans produce a book which they pretend was written by Adam. But concerning these we have no guide to direct us any more than concerning the supposed books of Enoch; some of which, Origin tells us, were found in Arabia Felix, in the dominion of the queen of Saba. Tertullian affirms, that he saw and

Alphabet. and red ſeveral pages of them; and in his treatiſe *De Habitu Mulierum*, he places thoſe books among the canonical: but St Jerom and St Auſtin look upom them to be apocryphal. William Poſtellus pretended to compile his book *De Originibus* from the book of Enoch: and Thomas Bangius publiſhed at Copenhagen, in 1656, a work which contains many ſingular relations concerning the manner, of writing among the antediluvians, which contain ſeveral pleaſant ſtories concerning the books of Enoch.

"With regard to this patriarch, indeed, St Jude informs us, that he *propheſied*, but he does not ſay that he *wrote*. The writings, therefore, attributed to the antediluvians, muſt appear quite uncertain; thought might be improper to aſſert that letters were unknown before the deluge recorded by Moſes."

14 All the alphabets in the world cannot be proved to ariſe from one original.

Our author proceeds to ſhow, that all the alphabets in the world cannot be derived from one original; becauſe there are a variety of alphabets uſed in different parts of Aſia, which vary in name, number, figure, order, and power, from the Phœnician, ancient Hebrew, or Samaritan. In ſeveral of theſe alphabets alſo, there are marks for ſounds peculiar to the language of the eaſt, which are not neceſſary to be employed in the notation of the languages of Europe.

None of the alphabets of the eaſt of Perſia have any connection with the Phœnician or its derivatives, except where the Arabic letters have been introduced by the conqueſts of the Mahometans. The foundation of all the Indian characters are thoſe called *ſhanſcrit*, or *ſungſkrit*. This ſignifies ſomething brought to perfection, in contradiſtinction to *prakrit* which ſignifies vulgar or unpoliſhed. Hence the refined and religious language and characters of India are called *Sungſkrit*, and the more vulgar mode of writing and expreſſion *Prakrit*. From this Shanſcrit are derived the ſacred characters of Thibet, The Caſhmirian, Bengaleſe, Malabric, and Tamoul; the Singaleſe, Siameſe, Maharattan, Concanee, &c. From the ſame ſource we may derive the Tangutic, or Tartar characters, which are ſimilar, in their great outlines, to the Shanſcrit; though it is not eaſily determined which is derived from the other. The common Tartar is generally read, like the Chineſe, from top bottom.

There are, however, ſeveral alphabets uſed in different parts of Aſia, entirely different not only from the Shanſcrit and all thoſe derived from it, but alſo from the Phœnician and thoſe which proceed from it. Some of theſe are the alphabet of Pegu, the *Batta* characters uſed in the Iſland of Sumatra, and the *Barman* or *Boman* characters uſed in ſome parts of Pegu. The names and powers of the letters of which theſe alphabets are compoſed, differ entirely from the Phœnician, or thoſe derived from them. It is impoſſible to aſſimilate their forms, and indeed it is by no means eaſy to conceive how the 50 letters of the Schanſcrit language could be derived from the Phœnician alphabet, which conſiſted originally only of 13; though it is certain, that by far the greater number of alphabets now in uſe are derived from the ancient Hebrew, Phœnician, or Samaritan.

Mr Aſtle next proceeds to conſider what alphabets are derived from the Phœnician. Theſe he ſuppoſes to have been immediately the ancient Hebrew or Samaritan; the Chaldaic; the Baſtulian (A) or Spaniſh Phœnician; the Punic, Carthaginian, or Sicilian; and the Pelaſgian. From the ancient Hebrew proceeded the Chaldaic or ſquare Hebrew; the round Hebrew; and what is called the *running hand of the Rabbins*. The Pelaſgian gave birth to the Etruſcan, Eugubian, or Umbrian, Oſcan, Samnite, and Ionic Greek, written from the left. From the Chaldaic or ſquare Hebrew are derived the Syriac, and the ancient and modern Arabic. The Syriac is divided into the Eſtrangelo and Mendæan, and the modern Arabic has given riſe to the Perſian and Turkiſh. From the ancient Arabic are derived the Kufic or Oriental, the Mauritanic or Occidental; the African or Saracen, and the Mooriſh. The Ionic Greek gave riſe to the Arcadian, Latin, ancient Gauliſh, ancient Spaniſh, ancient Gothic, Coptic, Ethiopic, Ruſſian, Illyrian or Sclavonic, Bulgarian and Armenian. From the Roman are derived the Lombardic, Viſigothic, Saxon, Gallican, Franco-Gallic or Merovingian, German, Caroline, Capetian, and modern Gothic.

Alphabet. 15 Alphabets derived from the Phœnician.

The Punic letters are alſo called *Tyrian*, and were much the ſame with the Carthaginian or Sicilian. The Punic language was at firſt the ſame with the Phœnician; it is nearly allied to the Hebrew, and has an affinity with the Chaldee and Syriac. Some remains of it are to be met with in the Malteſe. To make a complete Punic, Carthaginian, or Sicilian alphabet, we muſt admit ſeveral pure Phœnician letters.

The Pelaſgi were likewiſe of Phœnician original; and, according to Sanconiatho, the Dioſcuri and Cabiri wrote the firſt annals of the Phœnician hiſtory, by order of Taaut the inventor of letters. They made ſhips of burthen, and being caſt upon the coaſt near mount Caſius, about 40 miles from Peluſium, where they built a temple in the ſecond generation after the deluge related by Moſes, they were called *Pelaſgi* from their paſſing by ſea, and wandering from one country to another. Herodotus informs us, that the Pelaſgi were deſcendants of the Phœnician Cabiri, and that the Samothracians, received and practiſed the Cabiric myſteries from them. The Pelaſgic alphabet prevailed in Greece till the time of Deucalion, when the Pelaſgi were driven out of Theſſaly or Oenotria by the Hellenes; after which ſome of them ſettled at the mouth of the Po, and others at Croton, now *Cartona* in Tuſcany. Their alphabet conſiſted of 16 letters, and the Tyrrhenian alphabet, brought into Italy before the reign of that prince, conſiſted of no more than 13. Deucalion is ſaid to have reigned about 820 years after the deluge, and 1529 before the Chriſtian æra.

That the Tyrrheni, Tyrſeni, or Hetruſci, ſettled in Italy long before this period, appears from the teſtimony of Herodotus, who informs us, that a colony went by ſea from Lydia into Italy under Tyrrhenus; and Dionyſius of Halicarnaſſus proves that many authors called them Pelaſgi. He then cites Hellanicus Leſbicus, an author ſomewhat more ancient than Herodotus,

(A) The Baſtuli are ſaid to have been a Canaantiſh or Phœnician people who fled from Joſhua, and ſettled afterwards in Spain.

rodotus, to prove, that they were first called *Pelasgi Tyrrheni*; and when they passed into Italy, they settled in that part of it called *Etruria*. Their emigration took place about the year of the world 2011, or 1993 years before the Christian æra, which is 350 years before the Pelasgi left Greece. Bishop Cumberland adduces many proofs to show that the Tyrrhenians originally came out of Lydia into Italy. Several Roman authors also speak of this Lydian colony; and Horace compliments his patron Mæcenas upon his Lydian descent:

Lydorum quicquid Etruscos
Incoluit fines, nemo generosior est te.

The Etruscan letters are Pelasgic, and several of the Etruscan inscriptions are written in the Pelasgic language. The Roman letters are Ionic. The Oscan language was a dialect of the Etruscan; their characters are nearer the Ionic or Roman than the Etruscan. There is also very little difference between the Pelasgian, Etruscan, and most ancient Greek letters, which are placed from right to left. The Arcadians were ancient Greeks, and used the Ionic letters; but at what time they began to write from left to right is not known, as their chronology is very uncertain. The Etruscan, Oscan, and Samnite alphabets, are derived from the Pelasgic; they differ from each other more in name than in form, but a far greater number are derived from the Ionic Greek; namely, the Arcadian, the Latin or Roman, and the others already enumerated. The Runic is immediately derived from the Gothic.

According to Dionysius of Halicarnassus, the first Greek colony which came into Italy consisted of Arcadians under the conduct of Oenotrus the son of Lycaon, and fifth in descent from Phoroneus the first king of Argos, who reigned about 566 years before the taking of Troy, and 1750 years before the Christian æra. These Oenotrians were called *Aborigines*; and after they had been engaged for many years in a war with the Siculi, entered into an alliance with a colony of the Pelasgi, who came out of Thessaly into Italy, after having been driven from the fomer country.—About 1476 B.C. another colony of the Pelasgi, who had been driven out of Thessaly by the Curetes and Leleges, arrived in Italy, where they assisted the Aborigines to drive out the Siculi; possessing themsolves of the greatest part of the country between the Tiber and the Liris, and building several cities. Solinus and Pliny tell us, that the Pelasgi first carried letters into Italy; and the latter distinguishes between the Pelasgi and the Arcades: so the letters first carried into Italy were not the Ionic Greek, but those more ancient Pelasgic characters which the Pelasgi carried with them before Deucalion and Cadmus are said to have come into Bœotia and Thessaly. The story of Cadmus is much involved in fable; but it is agreed by most of the ancients, that the children of Agenor, viz. Cadmus, Europa, Phœnix, and Cilix, carried with them a colony composed of Phœnicians and Syrians, into Asia Minor, Crete, Greece, and Lybia, where they introduced letters, music, poetry, and other arts, sciences, and customs of the Phœnicians.

Dionysius enumerates the following Greek colonies which came into Italy: 1. The Aborigines under Oenotrus from Arcadia. 2. The Pelasgic colony which came from Hœmonia or Thessaly. 3. Another Arcadian colony which came with Evander from Palantium. 4. Those who came from Peloponnesus with Hercules; and, 5. Those who came with Æneas from Troy. It is not easy to discover when the Ionic way of writing from left to right was introduced into Italy; but it is certain, that it did not universally prevail even in Greece till several ages after it was found out. The Athenians did not comply with it till the year of Rome 350; nor was it practised by the Samnites even in the 6th century of that city, or 230 years before Christ: for M. Gæbelin, Vol. VI. pl. 2. gives us the Samnite alphabet of that century, wherein the letters are placed from right to left, although the Ionic way of writing prevailed in some parts of Italy in the third century of Rome. "In time (says Pliny), the tacit consent of all nations agreed to use the Ionic letters. The Romans consented to this mode about the time of Tarquinius Priscus their fifth king." The letters brought by Damaratus the Corinthian, the father of Tarquin, Mr Wise thinks, must have been the new or Ionic alphabet, and not the same with that brought by Evander 500 years before. After the Romans had established the use of the Ionic letters, they seem not to have acknowledged the Pelasgian and Etruscan to have been Greek alphabets: the most learned of them knew none older than the Ionic, as appears from the Greek Farnese inscriptions of Herodes Atticus. This learned man, out of a regard to antiquity, caused the oldest orthography to be observed in the writing, and the letters to be delineated after the most antique forms that could be found; and they are plainly no other than the Ionic or right-handed characters.

See Plates XI and XII. for specimens of the ancient alphabets here enumerated.

The ancient Gaulish letters are derived from the Greek, and their writing approaches more nearly to the Gothic than that of the Romans: this appears by the monumental inscription of Gordian, messenger of the Gauls, who suffered martyrdom in the third century with all his family. These ancient Gaulish characters were generally used by that people before the conquest of Gaul by Cæsar; but after that time the Roman letters were gradually introduced. The ancient Spaniards used letters nearly Greek before their intercourse with the Romans. The ancient Gothic alphabet was very similar to the Greek, and is attributed to Ulphilas, bishop of the Goths, who lived in Mæsia about 370 years after Christ. He translated the Bible into the Gothic tongue. This circumstance might have occasioned the tradition of his having invented these letters; but it is probable that these characters were in use long before this time. The Runic alphabet is derived from the ancient Gothic.

The Coptic letters are derived immediately from the Greek. Some have confounded them with the ancient Egyptian; but there is a very material difference between them. The Ethiopic alphabet is derived from the Coptic.

The alphabet proceeding from that of the Scythians established in Europe, is the same with what St Cyril calls the *Servien*. The Russian, Illyrian or Sclavonic, and the Bulgarian, are all derived from the Greek. The Armenian letters differ very much from the Greek, from which they are derived, as well as from the Latin. 16

Alphabets derived from the Latin.

With regard to the alphabets derived from the Latin, the Lombardic relates to the manuscripts of Italy; the

the Visigothic to those of Spain; the Saxon to those of England; the Gallican and Franco-Gallic or Merovingian to the manuscripts of France; the German to those of that country; and the Caroline Capetian, and Modern Gothic, to all the countries of Europe who read Latin. The first six of these alphabets are before the age of Charlemagne, the last three posterior to it. They are more distinguished by their names than the forms of their characters, and the former indicate all of them to have been of Roman extraction. Each nation, in adopting the letters of the Romans, added thereto a taste and manner peculiar to itself, which obviously distinguished it from the writings of all other people; whence arose the differences between the writings of the Lombards, Spaniards, French, Saxons, Germans, and Goths, and all the strange terms observeable in the writings of the Francic Gauls or Merovingians; and those of the Carlovingians their successors may be traced from the same source. From these distinctions the name of *national writing* was derived.

The writing of Italy was uniform till the irruption of the Goths, who disfigured it by their barbarous taste. In 569, the Lombards, having possessed themselves of all Italy, excepting Rome and Ravenna, introduced that form of writing which goes under their name; and as the Popes used the Lombardic manner in their bulls, the name of *Roman* was sometimes given to it in the 11th century; and though the dominion of the Lombards continued no longer than 206 years, the name of their writing continued in Italy from the 7th to the 13th century, and then ceased; when learning, having declined in that as well as in other countries, the manner of writing degenerated into the modern Gothic.

The Visigoths introduced their form of writing into Spain, after having over-run that country; but it was abolished in a provincial synod held at Leon in 1091, when the Latin characters were established for all public instruments, though the Visigothic were used in private writings for three centuries afterwards.

The Gauls, on being subjected by the Romans, adopted their manner of writing; but, by subsequent additions of their own, their characters were changed into what is called the Gallican or *Roman Gallic* mode. This was changed by the Franks into the *Franco-Gallic* or *Merovingian* mode of writing, being practised under the kings of the Merovingian race. It took place towards the close of the sixth century, and continued till the beginning of the ninth.

The German mode of writing was improved by Charlemagne, and this improvement occasioned another distinction in writing by introducing the alphabet named *Caroline*, which declined in the 12th century, and was succeeded in the 13th by the modern Gothic. In France it had degenerated by the middle of the 10th century, but was restored in 987 by Hugh Capet, whence it obtained the name of *Capetian*. It was used in England as well as Germany and France.

The modern Gothic, which spread itself all over Europe in the 12th and 13th centuries, is improperly named, as not deriving its origin from the writing anciently used by the Goths. It is, however, the worst and most barbarous way of writing, and originated among the schoolmen in the decline of the arts; being indeed nothing else than Latin writing degenerated. It began in the 12th century, and was in general use, especially among monks and schoolmen, in all parts of Europe, till the restoration of arts in the 15th century, and continued longer in Germany and the northern nations. The statute books are still printed in Gothic letters. The most barbarous writing of the seventh, eighth, and ninth centuries, was preferable to the modern Gothic. It is diversified in such a manner as can scarce admit of description; and the abbreviations used by the writers were so numerous, that it became very difficult to read it; which was one of the great causes of the ignorance of those times. Along with this, however, the Lombardic, Gothic, Roman, Caroline, and Capetian modes of writing, were occasionally used by individuals.

The idea that all the alphabets abovementioned are derived from the Roman, tends to prove the distinction of national writing, and is of great use in discovering the age of manuscripts: for though we may not be able exactly to determine the time when a manuscript was written, we may be able nearly to ascertain its age. For example, if a writing is Merovingian, it may be declared not to be posterior to the ninth, nor prior to the fifth, century. If another be Lombardic, it may be affirmed to be posterior to the middle of the 6th, and prior to the 13th. Should it be Saxon, it cannot be of an earlier date than the 7th, nor later than about the middle of the 12th.

17
Letters could not take place but from a decomposition of language.

Having considered whence the alphabets now in use throughout the various nations of the world are derived, it remains to say something concerning them as the elements of words, or how far they are capable of expressing those sounds, which, by proper combination and arrangement, constitute articulate language. The number of simple sounds in any language cannot be very numerous; and it is plainly these simple sounds alone that we have occasion to represent by alphabetical characters. Hence the person who first invented letters, must have been capable of analysing language in a manner which seems by no means easy to do, and concerning which even the learned among ourselves are not yet agreed. It is this difficulty which has produced the great diversity in the number of alphabetical characters used by different nations; and where we see a vast number of them used, we may account the writing not the better, but much the worse for it; and whoever the pretended inventor was, it is more reasonable to suppose that he disfigured an alphabet already invented, by unnecessary additions, than been the author of one himself.

18
Probably not the result of a progressive evolution of the human powers.

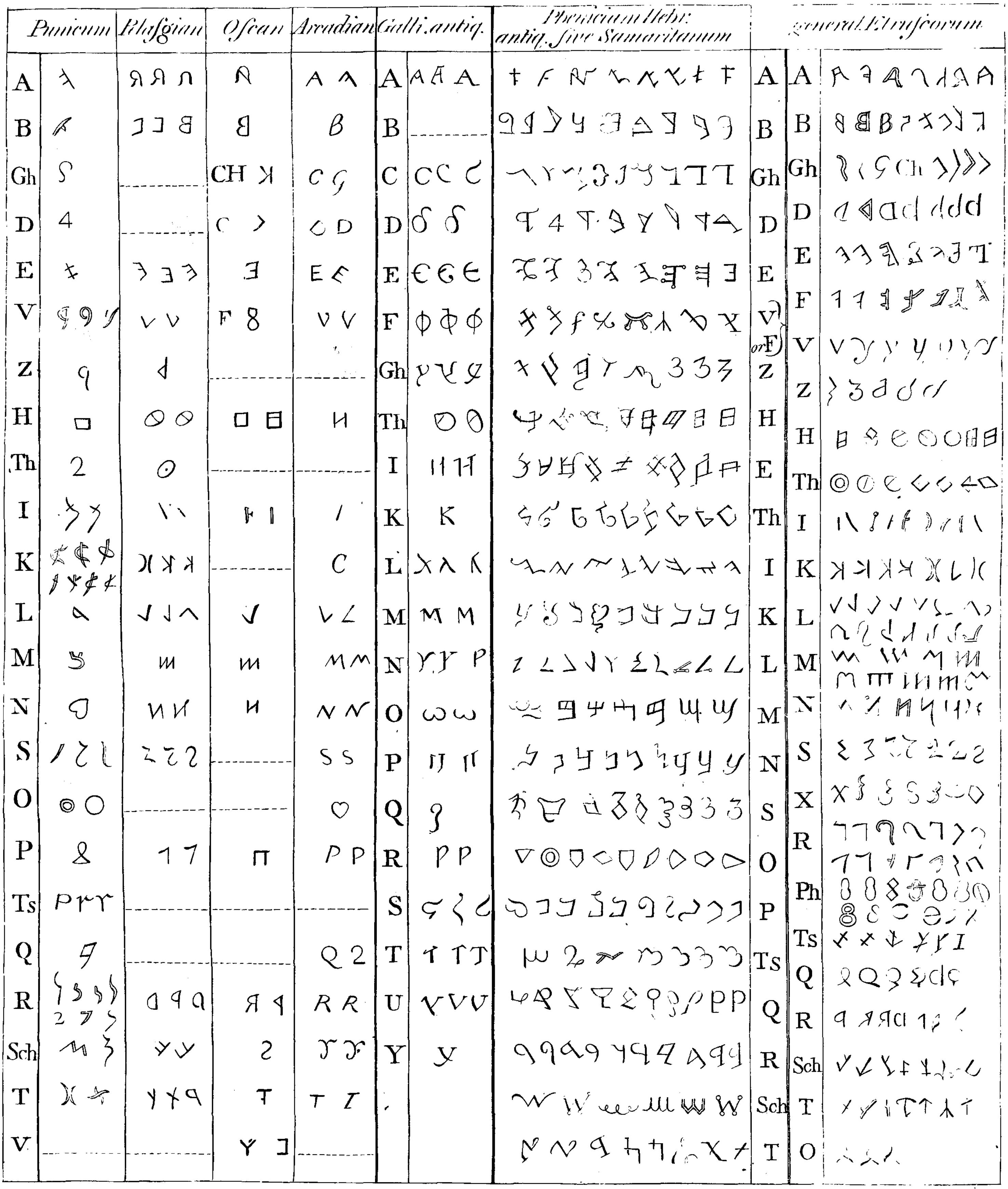
When we consider alphabetical characters as thus resulting from an analysis of language, it will by no means appear probable that it was derived from a gradual and progressive operation of the human mind through many ages. There is not the least affinity betwixt representing any object by a picture and finding out the sounds which compose the word by which it is expressed; nor, though a nation had been in use to represent things either in this method, or by any kind of arbitrary marks, for thousands of years, could the one ever have led to the other. Arbitrary marks must always be the same with pictures in this respect, that they must always be fixed to particular objects, and thus be increased *ad infinitum*. Letters, on the other hand, are indifferent to all

ALPHABETA ANTIQUISSIMA Plate VI

a dextra ad sinistram exarat — *a sinistra ad dextram*

ALPHABETA ANTIQUA.

Plate XII



Alphabet. all objects, and therefore, by their combinations, which are more numerous than as many arbitrary marks as we could remember, may express all the objects in nature. This might furnish an argument of some strength for the divine revelation of writing, were it not that other arts seemingly as useful, and as difficult to be invented, hve been expressly ascribed to particular persons whom we cannot suppose to have been divinely inspired. Thus metallurgy, music, the keeping of cattle, and use of tents, are all ascribed to a single family; and though writing be not expressly mentioned as an invention in Scripture, there is no reason to have recourse to a revelation for it as long as the human faculties are known to have been sufficient for the invention of it. Neverthelefs, if we take a review of the different arts which mankind have invented, we shall find, that few of them resulted from any gradual progress or evolution of the powers of the human mind, but rather by some sudden and almost unaccountable turn of thought in an individual. Thus, the art of printing, little inferior in its utility to that of writing, lay hid for ages, and was at last invented we scarce know how; so that if one inclined to suppose this a divine revelation, he could be at little loss for arguments to support his hypothesis. This was what all the inventions and evolutions of human powers since the creation had never been able to accomplish; yet nobody believes that it required supernatural abilities to be the author of this art, because we see plainly that it might have occurred to the human mind from various sources, and are surprised that it did not occur long before. In like manner, the method of accounting for the celestial motions by the united forces of projection and gravitation, was no result of the progress that mankind had made in science, but luckily occurred to Mr Horrox, without any thing that we know to direct him, or perhaps from causes almost unknown to himself. Thus also, the steam-engine, aerostation, &c. were suddenly invented only by a slight review of principles well known before, and which had been a thousand times overlooked by those who might have invented both. Alphabetic writing, therefore, might have been no deduction from hieroglyphic or picture writing, from which it is essentially different; and it seems to be some confirmation of this, that all nations whoever pretended to the invention of letters, have ascribed it to the labours of one particular person, without taking notice of the progress made towards it in preceding ages.

19
Of the elementary sounds of language.

The learned author of Hermes informs us, that to about 20 plain elementary sounds, we owe that variety of articulate voices which have been sufficient to explain the sentiments of such an innumerable multitude as all the past and present generations of men. Mr Sheridan says, that the number of simple sounds in our tongue are 28; while Dr Kenrick says, that we have only 11 distinct species of articulate sounds, which even by contraction, prolongation, and composition, are increased only to the number of 16; every syllable or articulate sound in our language being one of the number. Bishop Wilkins and Dr William Holder speak of 32 distinct sounds.

After the analysis or decomposition of language into the elementary sounds, the next towards the notation of it by alphabetical characters, would be the delineation of a separate mark or letter to represent each sound; which marks, though few in number, would admit of such a variety of arrangements and combinations, as might be capable of producing that infinity of articulate sounds which compose language. The ingenious Wachter, in his *Naturae et Scripturae Concordia*, p. 64, endeavours to show, that ten marks or characters are sufficient for this purpose.—His scheme is as follows:

Genus	*Figura.*	*Potestas.*
Vocal.	ʘ	a. e. i. o. u.
Guttural.	♀	k. c. ch. q. g. h.
Lingual.	∠	l.
Lingual.	I	d. t.
Lingual.	⊃	r.
Dental.	⊓	f.
Labial.	3	b. q.
Labial.	m	m.
Labial.	⊨	s. ph. v. w.
Nasal.	ʌ	n.

If this is the case, then the most simple alphabet, which consisted only of 13 letters, must have been abundantly sufficient to answer all the purposes of mankind, and much of our twenty-four letter alphabet may appear superfluous. That able mathematician Tacquet has calculated the various combinations of the 24 letters, even without any repetition, to amount to no fewer than 620,448,401,733,239,439,360,000; while Clavius makes them only 5,852,616,738,497,664,000. Either of these numbers, however, are *infinite* to the human conceptions, and much more than sufficient to express all the sounds that ever were articulated by man. As there are more sounds in some languages than in others, it follows of course, that the number of elementary characters, or letters, must vary in the alphabets of different languages. The Hebrew, Samaritan, and Syriac alphabets, have 22 letters; the Arabic 28, the Persian and Egyptian, or Coptic, 32; the present Russian 41; the Shanscrit 50; while the Cashmirian and Malabaric are still more numerous. The following is the scheme of the Engish alphabet as given by Mr Sheridan in his Rhetorical Grammar, p. 9.

20
Number of letters in different alphabets.

Number of simple sounds in our tongue 28.

9 *Vowels*, $\overset{3}{\text{a}}$ $\overset{1}{\text{a}}$ $\overset{2}{\text{a}}$ $\overset{3}{\text{e}}$ $\overset{2}{\text{o}}$ $\overset{3}{\text{o}}$ $\overset{1}{\text{e}}$ $\overset{1}{\text{i}}$ $\overset{1}{\text{u}}$
hail hat hate beer note noose bet fit but
w y
short oo short ee

19 *Consonants*, { eb ed ef eg ek el em en ep er es et ev ez eth *eth* esh ezh ing.

2 *Superfluous*, *c*, which has the power of *ek* or *ess*; *q*, that of *ek* before *u*.

2 *Compound*,

2 *Compound*, *j*, which ſtands for *edzh* :
x, for *ks* or *gz*.

1 *No letter*, *h*, merely a mark of aſpiration.

Conſonants divided into Mutes and Semivowels.

6 *Mutes*, eb ed eg ek ep et.
3 *Pure Mutes*, ek ep et.
3 *Impure*, eb ed eg.

13 *Semivowels, or liquids*, } ef el em en er eſs ev ez *eth* eth eſh ezh ing.
9 *Vocal*, el em en er ev ez eth ezh ing.
4 *Aſpirated*, ef eſs eth eſh.

Divided again into.

4 *Labial*, eb ep ev ef.
8 *Dental*, ed et eth ez eſs *eth* ezh eſh.
4 *Palatine*, eg ek el er.
3 *Naſal*, em en ing.

21 Imperfection in the Engliſh alphabet.

Mr Sheridan obſerves, that our alphabet is ill calculated for the notation of the Engliſh tongue, as there are many ſounds for which we have no letters or marks: and there ought to be nine more characters or letters to make a complete alphabet, in which every ſimple ſound ought to have a mark peculiar to itſelf. The reaſon of the deficiency is, that the Roman alphabet was formerly adopted for the notation of the Engliſh language, though by no means ſuited to the purpoſe.

22 Of the forms of letters.

It now remains only to take ſome notice of the forms of the different letters; ſome knowledge of which is abſolutely neceſſary, for aſcertaining the age and authenticity of inſcriptions, manuſcripts, charters, and ancient records. Many authors are of opinion that letters derive their forms from the poſitions of the organs of ſpeech in their pronunciation. Van Helmont has taken great pains to prove, that the Chaldaic characters are the genuine alphabet of Nature; becauſe, according to him, no letter can be rightly ſounded without diſpoſing the organs of ſpeech into an uniform poſition with the figure of each letter; and in ſupport of this ſyſtem, he has anatomiſed the organs of articulation.

Mr Helme has endeavoured to ſhow, that all elementary characters or letters derive their forms from the line and the circle. His alphabet conſiſts of 13 radical letters, four diminiſhed, and four augmented.—The radicals are D, O, S, A, B, C, D, N, U, I, E, M, R.—H, according to him, is derived from A; P from B; T from D; and F from U: theſe are all called diminiſhed letters. The augmented ones are Z from S; G from C; W from U: and Y from I. He proves that his characters are very ſimilar to thoſe of the ancient Etruſcans: but all characters are compoſed either of lines and circles of the former, and of parts of the latter.—Mr Gebelin deduces them from hieroglyphic repreſentations, and has given ſeveral delineations of human figures, trees, &c. in confirmation of this hypotheſis.

One of the moſt ſimple alphabets has been formed, by making two perpendicular and two horizontal lines:

thus,
a|b|c
d|e|f
g|h|i
from which may be deduced nine different characters or letters; thus

a| |b| |c d| |e| |f g| |h| |i.

Nine more may be made by adding a point to each, and as many more as
k|l|m
n|o|p
q|r|s
may be ſufficient for the notation of any language, by adding two or more points to each character. Though theſe ſquare characters are not calculated for diſpatch; yet they may be made as expeditiouſly, or more ſo, than the Tartar, the Bramin, the Caſhmirian, or many others. Writing compoſed of theſe characters, is at firſt ſight ſomewhat like the Hebrew.

23 New language invented by Mr Dow.

—Mr Dow, author of the Hiſtory of Indoſtan, lately formed a new language and alphabet. This language, and the characters formed for its notation, were ſo eaſy, that a female of his acquaintance acquired a knowledge of them in three weeks, and correſponded with him therein during their intimacy.

ALPHÆNIX, white barley-ſugar, to which is given an extraordinary name, to render it more valuable. This ſugar, which is thought good for colds, is made of common ſugar, which is boiled until it becomes eaſy to crack, when they pour it upon a marble table, greaſed with oil of ſweet almonds, and mould it into various figures with a braſs crotchet. It is eaſily falſified with ſtarch.

ALPHERY (Mikipher), born in Ruſſia, and of the Imperial line. When that country was torn to pieces by inteſtine quarrels, in the latter end of the 16th century, and the royal houſe particularly was ſo ſeverely perſecuted by impoſtors, this gentleman and his two brothers were ſent over to England, and recommended to the care of Mr Joſeph Bidell, a Ruſſia merchant. Mr Bidell, when they were of age fit for the univerſity, ſent them all three to Oxford, where the ſmall-pox unhappily prevailing, two of them died of it. We know not whether this ſurviving brother took degrees or not, but it is very probable he did, ſince he entered into holy orders; and in the year 1618, had the rectory of Wooley in Huntingtonſhire, a living of no very conſiderable value, being rated at under L.10 in the king's books. Here he did his duty with great cheerfulneſs and alacrity; and although he was twice invited back to his native county by ſome who would have ventured their utmoſt to have ſet him on the throne of his anceſtors, he choſe rather to remain with his flock, and to ſerve God in the humble ſtation of a pariſh prieſt. Yet in 1643, he underwent the ſevereſt trials from the rage of the fanatics; who, not ſatisfied with depriving him of his living, inſulted him in the moſt barbarous manner; for having procured a file of muſqueteers to pull him out of his pulpit, as he was preaching on a Sunday, they turned his wife and ſmall children into the ſtreet, into which alſo they threw his goods. The poor man in this diſtreſs raiſed him a tent under ſome trees in the church-yard, over againſt his houſe, where he and his family lived for a week. One day having gotten a few eggs, he picked up ſome rotten wood and dry ſticks, and with theſe made a fire in the church-porch in order to boil them; but ſome of his adverſaries, to ſhow how far they could carry their rage againſt the church, for this poor man was ſo harmleſs they could have none againſt him, came and kicked about his fire, threw down his ſkillet, and broke his eggs. After this, having ſtill a little money, he made a ſmall purchaſe in that neighbourhood, built him

him a house, and lived there some years. He was encouraged to this by a Presbyterian minister who came in his room, who honestly paid him the fifth part of the annual income of the living, which was the allowance made by parliament to ejected ministers, treated him with great humanity, and did him all the services in his power. It is a great misfortune that this gentleman's name is not preserved, his conduct in this respect being the more laudable, because it was not a little singular. Afterwards, probably on the death or removal of this gentleman, Mr Alphery left Huntingdonshire, and came and resided at Hammersmith till the Restoration put him in possession of his living again. He returned on this occasion to Huntingtonshire, where he did not stay long; for being upwards of 80, and withal very infirm, he could not perform the duties of his function. Having, therefore, settled a curate, he retired to his eldest son's house at Hammersmith, where shortly after he died, full of years and of honour.

ALPHEUS, (Strabo); ALPHEUS, (Ptolemy); a noted and large river of the Peleponnesus; which, rising in, and after several windings running through, Arcadia, and by Olympia in Elis, with a south-west course, pours into the Sinus Chelonites, about ten miles to the south of Olympia. It has a common spring with the Eurotas, at the foot of mount Parthenius, near the village Asea, (Strabo.) The Alpheus and Eurotas mix and run together for 20 stadia; after which, they enter a subterraneous passage at Mantinea; then again emerge, the Eurotas in Laconica, and the Alpheus in the territory of Megalopolis, (Pausanias.) The poets fable strange things of this river; particularly, that, out of love to the nymph *Arethusa*, it runs under the sea to Sicily, and bursts out at the fountain of that name in Syracuse, (Virgil). Its waters are reckoned good in the leprosy, which is called Αλφος by the Greeks; and hence the name *Alpheus*.—Pausanias adds, that the Eleans had a law, which condemned any woman to death that should either appear at the Olympic games, or even cross this river during that solemnity: and the Eleans add, that the only woman who transgressed it, had disguised herself in the habit of a master or keeper of these games, and conducted her son thither; but when she saw him come off victorious, her joy made her forget her disguise, so that her sex was discovered. She was pardoned, but from that time a law was made that the keepers should appear there naked.

ALPHONSIN, in surgery, an instrument for extracting bullets out of gun-shot wounds. This instrument derives its name from the inventor Alphonsus Ferrier, a physician of Naples. It consists of three branches, which are closed by a ring. When closed and introduced into the wound, the operator draws back the ring towards the handle, upon which the branches opening take hold of the ball; and then the ring is pushed from the haft, by which means the branches grasp the ball so firmly, as to extract it from the wound.

ALPHONSUS X. king of Leon and Castile, surnamed the Wise, was author of the astronomical tables called *Alphonsine*. Reading of Quintus Curtius gave him such delight, that it recovered him out of a dangerous illness. He read the Bible fourteen times, with several comments on it. He is said to have found fault with the structure of the mundane system, and has been charged with impiety on that score; but unjustly, for he only found fault with the involved system of some astronomers. He was dethroned by his son Sancho; and died of grief, A. D. 1284.

ALPINI (Prospero), a famous physician and botanist, born in the Venetian territory, 1553. He travelled in Egypt to acquire a knowledge of exotic plants, and was the first who explained the fructification and generation of plants by the sexual system. Upon his return to Venice, in 1586, Andrea Doria, prince of Melfi, appointed him his physician: and he distinguished himself so much in this capacity, that he was esteemed the first physician of his age. The republic of Venice began to be uneasy, that a subject of theirs, of so great merit as Alpini, should continue at Genoa, when he might be of so much service and honour to their state: they therefore recalled him in 1593, to fill the professorship of botany at Padua; and he had a salary of 200 florins, which was afterwards raised to 750. He discharged this office with great reputation; but his health became very precarious having been much broke by the voyages he had made. According to the register of the university of Padua, he died the 5th of February 1617, in the 64th year of his age; and was buried the day after, without any funeral pomp, in the church of St Anthony.—Alpini wrote the following works in Latin: 1. Of the physic of the Egyptians, in four books. Printed at Venice, 1591, in 4to. 2. A treatise concerning the plants of Egypt. Printed at Venice, 1592, in 4to. 3. A dialogue concerning balsams. Printed at Venice, 1592, in 4to. 4. Seven books concerning the method of forming a judgment of the life or death of patients. Printed at Venice, 1691, in 4to. 5. Thirteen Books concerning methodical Physic. Padua, 1611, folio; Leyden, 1719, in 4to. 6. A Disputation held in the school at Padua, concerning the Raphonticum. Padua, 1612, and 1629, 4to. 7. Of exotic plants, in two books. Venice, 1699, in 4to. He left several other works, which have never been printed; particularly, 8. The fifth book concerning the physic of the Egyptians. 9. Five books concerning the natural history of things observed in Egypt, adorned with a variety of draughts of plants, stones, and animals.

ALPINIA, in botany: A genus of the monogynia order, belonging to the monandria class of plants; and in the natural method ranking under the 8th order, *Scitamineæ*. The characters are: The *calyx* is a perianthium above, small, and trifid: The *corolla* is monopetalous, unequal, and as if doubled: The *stamina* consist of one filament, with linear antheræ joining to the margin: The *pistillum* has a roundish germen, beneath; the stylus simple, and the stigma obtusely trigonous: The *pericarpium* is a fleshy ovate trilocular capsule, with three valves: The *seeds* are ovate, and very numerous; the receptaculum is pulpy and very large. Of this genus there is but one species which is a native of the West Indies, where it grows naturally in most places. The leaves decay every winter, and are pushed out from the roots in the spring, like the ginger and maranta; so must be managed in the same manner as directed for these two plants, and may be propagated by parting the roots when the leaves decay.

Alpiste, Alps.

ALPISTE, or ALPIA, a sort of seed used to feed birds with, especially when they are to be nourished for breeding. The alpiste seed is of an oval figure, of a pale yellow, inclining to an isabel colour, bright and glossy. It is an article of the corn-chandlers and seedsmens trade.

ALPS (anc. geog.), a range of high mountains, separating Italy from Gaul and Germany, in the form of a crescent. They take their rise from the Vada Sabatia, or Savona; and reach to the Sinus Flanaticus (now Golfo di Carnaro of the Adriatic), and the springs of the river Colapis (now the Kulpe); extending, according to Livy, 2000 stadia in length, or 250 miles: they are divided into several parts, and accordingly have different names. From Savona to the springs of the Varus, where the Alps lie against the sea of Genoa, they are called *Maritimæ*, now *le Montagne di Tenda*. These extend from south to north, between Gaul to the west, and Genoa to the east, beginning at Monaco on the Mediterranean; then running out thro' the east of the county of Nice, and between that and the marquisate of Saluzzo, terminate at length at mount Viso, between Dauphine and Piedmont. Hence to Susa run the *Alpes Cottiæ* (Sueton.); *Cottanæ* (Tacitus); mountains extremely high, separating Dauphine from Piedmont, and extending from mount Viso to Mount Cenis, between the *Alpes Maritimæ* to the south, and the *Graiæ* to the north. The *Alpes Graiæ* (Pliny), so called from the passage of Hercules, begin from mount Cenis, where the *Cottiæ* terminate; and run out between Savoy and the Tarentese to the west, and Piedmont and the Duche d'Aouste to the east, quite to the Great St Bernard, where the *Alpes Penninæ* begin. They are also called by some *Graiæ Alpes*, and *Graius Mons* (Tacitus); which extend from west to east, between St Bernard and the Adula, or St Godart; and thus they run out between the Valese to the north, and the Milanese to the south. With these are continued the *Alpes Rhæticæ*, to the head of the river Piave; part of which are the *Alpes Tridentinæ*, to the north of Trent. To these join the *Alpes Noricæ*, reaching to Doblach in Tyrol, to the north of the river Tajamento: thence begin the *Alpes Carnicæ*, or of *Carniola*, extending to the springs of the Save: and the last, called, *Alpes Pannonicæ*, and *Juliæ*, extend to the springs of the Kulpe. Some, however, extend the Alps to the north of Dalmatia; others, again, to Thrace and the Euxine. But their termination at the Kulpe, as above, is more generally received. They were formerly called *Alpia*, and *Alpionia* (Strabo). Through these mountains Hannibal forced his passage into Italy, by pouring vinegar on the rock, heated by burning large piles of wood on them, by which means they become crumbled (Livy). They are covered with perpetual snow.

The ALPS are the highest mountains in Europe; being, according to some geometricians, about two miles in perpendicular height. They begin at the Mediterranean; and stretching northward, separate Piedmont and Savoy from the adjacent countries; whence directing their course to the east, they form the boundary between Switzerland and Italy, and terminate near the extremity of the Adriatic Sea, north-east of Venice. It was over the western part of those mountains, towards Piedmont, that Hannibal forced his passage into Italy.

The prospect from many parts of this enormous range of mountains is extremely romantic, especially towards the north-west. One of the most celebrated is the Grande Chartreuse, where is a monastery founded by St Bruno about the year 1084. From Echelles, a little village in the mountains of Savoy, to the top of the Chartreuse, the distance is six miles. Along this course the road runs winding up, for the most part not six feet broad. On one hand is the rock, with woods of pine trees hanging over head; on the other a prodigious precipice almost perpendicular; at the bottom of which rolls a torrent, that, sometimes tumbling among the fragments of stone which have fallen from on high, and sometimes precipitating itself down vast descents with a noise like thunder, rendered yet more tremendous by the echo from the mountains on each side, concurs to form one of the most solemn, the most romantic, and most astonishing scenes in nature. To this description may be added the strange views made by the craggs and cliffs, and the numerous cascades which throw themselves from the very summit down into the vale. On the top of the moutain is the convent of St Bruno, which is the superior of the whole order. The inhabitants consist of 100 fathers, with 300 servants, who grind their corn, press their wine, and perform every domestic office, even to the making of their clothes. In the Album of the fathers is admired an alcaic ode, written by the late ingenious Mr Gray when he visited the Chartreuse, and which has since been published among his works.

The glaciers of Savoy are also justly reckoned among the most stupendous works of nature. These are immense masses of ice, lodged upon the gentler declivities amidst the Alps, and exhibiting representations beyond conception fantastic and picturesque. In the extraordinary narrative of Mr Bourrit's journey hither, we meet with the following account of the Prieuré, in the valley of Chamouni. We had, says he, the magnificent prospect of a chain of mountains, equally inaccessible, and covered with ice; and above the rest that of Mount Blanc, whose top seemed to reach, and even pierce, the highest region of the clouds. The chain upon which this mountain looks down like a giant, is composed of masses of rocks, which terminate in pikes or spires, called the *Needles*, and which are ranged like tents in a camp. Their sides appear lighter and more airy, from the ornament of several hollow breaks and furrows fretted in the rock itself, as well as from the different streaks and panes of ice and snow, which, without changing the general character of their form, or the majesty of their appearance, give them a picturesque variety. Lower down, the eye surveys with ravishment the hills of ice, and the several glaciers, extending almost into the plain, whilst this appears like an artificial garden, embellished with the mixture of a variety of colours. We have a picturesque opposition to this chain, which is formed by innumerable mountains at the distance of near 50 leagues, between whose tops we have a glimpse of those several plains which they environ.

M. de Saussure, who had visited those mountains about two months before M. Bourrit, felt himself naturally electrified in this place. This extraordinary phenomenon seems not to have been experienced by the latter or his company; but they heard a long-continued

Alps.

tinued rumbling noiſe, like that of thunder, which was rendered more awful by the ſilence of the place where they ſtood. This noiſe proceeded from the ſubſequent cauſes, viz. the avalanches of ſnow, which ſeparated from the tops of the mountain, and rolled down to the bottom; conſiderable fragments of the rocks which followed them, overturning others in their fall; and maſſy blocks of ice, which precipitated from the ſummits.

The valley of Montanvert appears to be peculiarly romantic. Here, ſays M. Bourrit, we beheld a ſpacious icy plain entirely level. Upon this there roſe a mountain all of ice, with ſteps aſcending to the top, which ſeemed the throne of ſome divinity. It likewiſe took the form of a grand caſcade, whoſe figure was beyond conception beautiful; and the ſun, which ſhone upon it, gave a ſparkling brilliance to the whole. The valley on our right hand was ornamented with prodigious glaciers, that, ſhooting up to an immeaſurable height between the mountains, blend their colours with the ſkies, which they appear to reach.

Alps, beſides its proper ſignification, by which it denotes a certain chain of mountains which ſeparate Italy from France and Germany, is frequently uſed as an appellative to denote any mountains of extraordinary height or extenſive range. In this ſenſe, Auſonius and others call the Pyrenean mountains, *Alps*; and Gellius the Spaniſh Alps, *Alpini Hiſpani*.

Hence alſo we ſay, the *Britiſh Alps*, the *Aſiatic Alps*, the *Alps of America*.

The *Scottiſh Alps* terminate in a moſt ſublime and abrupt manner, at the great promintary the Alta Ripa of Ptolemy, the *Ord* or *Aird*, i.e. the *Height of Caithneſs*. The upper part is covered with gloomy heath; the lower is a ſtupendous precipice, excavated into vaſt caverns the haunt of ſeals and different ſea fowl. On the eaſtern ſide of the kingdom, this is the ſtriking termination of the vaſt mountains of Scotland which from its Highlands, the habitation of the original inhabitans, driven from their ancient ſeats by the anceſtors of Lowland Scots, deſcendants of Saxons, French, and Normans; congenerous with the Engliſh, yet abſurdly and invidiouſly diſtinguiſhed from them. Language, as well as ſtriking natural boundaries, mark their place. Their mountains face on the weſt the Atlantic ocean; wind along the weſt of Caithneſs, among which Morvern and Scaraben, Ben-Hop and Ben-Lugal, ariſe pre-eminent. Sutherland is entirely Alpine, as are Roſsſhire and Inverneſsſhire. Their *Summæ Alpes* are, Meal Fourvounich, the Coryarich, Benewiſh, and Beneviſh near Fort-William; the laſt of which is reported to be 1450 yards in height. Great part of Aberdeenſhire lies in this tract. It boaſts of another Morvern, ſoaring far beyond the others. This is the centre of the Grampian hills, and perhaps the higheſt from the ſea of any in Great Britain. They again comprehend the eaſtern part of Perthſhire, and finiſh on the magnificient ſhores of Lochlomond, on the eaſtern ſide of which Benlomond riſes, diſtinguiſhed among its fellows. From hence the reſt of north Britain forms a chain of humbler hills; but in Cumberland, part of Weſtmoreland, Yorkſhire, Lancaſhire, and Derbyſhire, the Alps reſume their former majeſty. A long and tame interval ſucceeds. The long ſublime track of Wales ariſes, the ancient poſſeſſion of the ancient Britiſh race. From the Ord, the great mountains recede inland, and leave a vaſt flat between their baſes and the ſea, fronting the waves with a ſeries of lofty rocky precipices, as far as the little creek of Staxigo; the whole a bold, but moſt inhoſpitable ſhore for ſhipping. Wick and Staxigo have indeed their creeks, or rather chaſms, which open between the cliffs, and may accidentally prove a retreat, unleſs in an eaſtern gale.

The *Aſiatic Alps* are deſcribed under the articles Altaic *Chain* and Werturian *Mountains*.

The *American Alps* are, The Andes or *Cordilleras*, in South America; and the Apalachian or *Allegany* mountains, in North America.

The higheſt ground in North America is placed by Captain Carver in lat. 57° weſt long. from Lond 98° between a lake from which the Oregon flows, and another called *White-bear Lake*, from which ariſes the Miſſiſippi.

This exalted ſituation is part of the Shining Mountains, which are branches of the vaſt chain which pervades the whole continent of America. It may be fairly taken from the ſouthern extremity, where Staten Land and Terra del Fuego riſe out of the ſea as inſulated links to an immenſe height, black, rocky, and marked with rugged ſpiry tops, frequently covered with ſnow. New Georgia may be added as another horribly congenial, riſing detached farther to the eaſt. The mountains about the Straits of Magellan ſoar to an amazing height, and infinitely ſuperior to thoſe of the northern hemiſphere under the ſame degree of latitude. From the north ſide of the Straits of Magellan, they form a continued chain through the kingdoms of Chili and Peru, preſerving a courſe not remote from the Pacific Ocean. The ſummits, in many places, are the higheſt in the world. There are not leſs than 12, which are from 2400 toiſes high to above 3000. Pichincha, wich impends over Quito, is about 35 leagues from the ſea; and its ſummit is 2430 toiſes above the ſurface of the water. Cayambe, immediately under the equator, is above 3000; and Chimborazo higher than the laſt by 200. Moſt of them have been volcanic, and in different ages marked with eruptions far more horrible than have been known in other quarters of the globe. They extend from the equator through Chili; in which kingdom is a range of volcanoes, from lat. 26. ſouth, to 45. 30. and poſſibly from thence into Terra del Fuego itſelf: which, forming the Straits of Magellan, may have been rent from the continent by ſome great convulſion, occaſioned by their labourings; and New Georgia forced up from the ſame cauſe. An unparalleled extent of plain appears on their eaſtern ſide. The river of Amazons runs along a level cloathed with foreſts, after it burſts from its confinement at the Pongo of Borjas, till it reaches its ſea-like diſcharge into the Atlantic Ocean.

In the northern hemiſphere, the Andes paſs through the narrow Iſthmus of Darien into the kingdom of Mexico, and preſerve a majeſtic height and their volcanic diſpoſition. The mountain Popocatepec made a violent eruption during the expedition of Cortez, which is moſt beautifully deſcribed by his hiſtorian Antonio de Solis. This, poſſibly, is the ſame with the volcano obſerved by the Abbé d'Auteroche, in his way from Vera Cruz to Mexico; which, from the nakedneſs of the lavas, he conjectured to have been but lately ly extinguished. From the kingdom of Mexico, this chain is continued northward, and to the east of California; then verges so greatly towards the west, as to leave a very inconsiderable space between it and the Pacific Ocean, and frequently detached branches jut into the sea, and form promontories; which, with parts of the chain itself, were often seen by our navigators in the course of their voyage. Some branches, as we have before observed, extend towards the east, but not to any great distance. A plain, rich in woods and savannas, swarming with bisons or buffaloes, stags, and Virginian deer, with bears, and great variety of game occupies an amazing tract, from the great lakes of Canada, as low as the Gulph of Mexico; and eastward to the other great chain of mountains, the Apalachian, which are the Alps of that side of northern America. Its commencement is supposed to be about Lake Champlain and Lake George, with branches pointing obliquely to the river St Laurance eastward, and rising on its opposite coasts; others extending with lowering progress, even into Nova Scotia. The main chain passes through the state of New York, where it is distinguished by the name of the *Highlands*, and lies within 40 miles of the Atlantic. From thence it recedes from the sea, in proportion as it advances, southward; and near its extremity in south Carolina is 300 miles distant from the water. It consists of several parallel ridges, divided by most inchanting vallies and generally cloathed with a variety of woods. These ridges rise gradually from the east, one above the other, to the central; from which they gradually fall to the west, into the vast plains of the Missisippi. The middle ridge is of an enormous bulk and height. The whole extends in breadth about 70 miles; and in many places leaves great chasms for the discharges of the vast and numerous rivers which rise in the bosoms of the mountains, and empty themselves into the Atlantic Ocean, after yielding a matchless navigation to the provinces they water.

Beyond the branch of the Apalachian mountains called *The Endless*, is another of amazing extent, nearly as high as the mountains themselves. This plain (called the *Upper Plains*) is exceedingly rich land; begins at the Mohock's River; reaches to within a small distance of Lake Ontario; and to the westward forms part of the extensive plains of the Ohio, and reaches to an unknown distance beyond the Missisippi. Vast rivers take their rise, and fall to every point of the compass; into Lake Ontario, into Hudson's River, and into the Delaware and Susquehanna. The tide of the Hudson's River flows thro' its deep-worn bed far up, even to within a small distance of the head of the Delaware; which, after a furious course down a long descent, interrupted with rapids, meets the tide not very remote from its discharge into the ocean.

ALPUXARRAS, or ALPAXARES, mountains of Spain, in the Province of Granada, on the Coast of the Mediterranean sea. They are about 17 leagues in length, and 11 in breadth, reaching from the city of Velez to Almeria. They are inhabited by Moors, who are the remains of the dispersion and ruin of their empire. They embraced the Christian religion; but persserve their own manner of living, and their language, though much corrupted. Here is a rivulet between Pitros and Portugos, which dyes linen that is dipped in it black in an instant. Near this rivulet is a cavern, from which proceeds so malignant a steam, that it destroys such animals as come near it. The Moriscos cultivate the soil extremely well, and plant fruit-trees, some of which grow to a prodigious height and thickness, and give the mountains a very agreeable aspect.

ALQUIER, a liquid measure, used in Portugal to measure oil, two of which make an almond. See ALMOND.

ALQUIFOU, or ARQUIFOU, is a sort of lead ore, which, when broken, looks like antimony. It is used by the potters to give a green varnish to their works, and thence is called potter's ore. It is met with in Cornwall, &c. The potters mix a small portion of manganese with the alquifou, and then the varnish of glazing on their ware is of a blackish hue.

ALREDUS, ALURED, or ALUREDUS, of Beverley, one of the most ancient and best English historians. He wrote in the reign of Henry I. There are no circumstances of his life known with any degree of certainty. It is generally believed that he was educated at Cambridge, and that he afterwards became one of the canons and treasurer of St John's at Beverley. And we learn in a note of bishop Tanner's, that, for the sake of improvemen, he travelled through France and Italy; and that at Rome he became domestic chaplain to cardinal Othoboni. He died in the year 1128 or 1129; leaving behind him the following works: 1. *The Annals of Alured of Beverley*. Oxford, 1726. Published by Mr Hearne, from a manuscript beloning to Thomas Rawlinson, Esq. It contains an abridgment of the history from Brutus to Henry I. written in good Latin; and with great accuracy. 2. *Libertates ecclesiæ St Johannis de Beverlac*, &c. a manuscript in the Cotton library. It is a collection of records relative to the church at Beverley, translated by our author from the Saxon language. The Biographia Britannica evidently proves these to be all that were written by Alredus.

ALRESFORD, a town of Hampshire, seated on the road from London to Southampton, close by the river Itching, which feeds a great pond to the left of the town. Part of a Roman highway runs from thence to Alton. It is a rectory, with the mediety of Old Alresford, of L.49: 12: 8 in the king's books. It consists of about 200 houses; has one church; two principal streets, which are large and broad; and a small manufacture of linseys.

ALSA, a river of Carniola (Pliny), now the *Ausa*; running by Aquileia with a short course from north to south, into the Adriatic; where Constantine, the son of Constantine the Great, fighting against Constans his brother, lost his life.

ALSACE, a province of France, bounded on the east by the Rhine, on the south by Swisserland, on the west by Lorrain, and on the north by the palatinate of the Rhine. It was formerly a part of Germany, but was given to France by the treaty of Munster. It is one of the most fruitful and plentiful provinces of Europe, abounding in corn, wine, wood, flax, tobacco, pulse, fruits, &c. The mountains which divide it from Lorrain are very high, and generally covered with firbeech, oak, and horn beam. Those on the side of Swisserland are

are less high; and furnished with all sorts of wood, as well for fuel as building. The country itself is diversified with rising hills and fertile vales, besides large forests; but that between the rivers Ill, Hart, and the Rhine, as far as Strasburgh, is inferior to the rest, on account of the frequent overflowing of the Rhine. In High Alsace there are mines of silver, copper, and lead. They however work none but those of Giromany, from which are annually drawn 1600 marks of silver, each mark being eight ounces; and 24,000 pounds of copper: but the expence of working them is almost equal to the profit. There are iron-works in several parts of Alsace, and particularly at Betford. There is a mineral spring at Sultsbach, near Munster, in High Alsace; which is in great reputation for the palsy, weakness of the nerves, and the gravel.—The original inhabitants of Alsace are honest and good-natured, but wedded to their own manners and customs. The fruitfulness of their country renders them indolent and inactive; for the Swiss make their hay and reap their corn, as well as manage the vintage of High Alsace, which sends a great deal of money out of the province. The common language is the German: however, the better sort of people speak French in the towns; and even in the country, they speak French well enough to be understood.

ALSEN, an island of Denmark in the lesser Belt, or entrance into the Baltic sea, between Sleswick and Funen. It is remarkable for nothing except two castles, and producing large crops of aniseeds, a carminative much used in seasoning the food and mixing with the bread all over the Danish Dominions. E. Long. 10. 12. N. Lat. 55. 12.

ALSFIELD, a town of Germany, in the landgraviate of Hesse Castle, ten miles north-west of Marpurg, and 35 south of Hesse Castle. It is an ancient town, and well built; and the inhabitants were the first of this country who embraced the Reformation. E. Long. 9. 5. N. Lat. 50. 40.

ALSHASH, a very beautiful city in Bucharia, supposed to be the same with that which is now called *Tashcant*, the capital of the eastern part of Turkestan, possessed by the Kassats. It is situated on the river *Sihûn*, now *Sír*, and had a well-watered garden for every house; but was ruined by Jenghiz Khan, who took the city, and caused a great number of its inhabitants to be massacred.

ALSHEDA, a parish of Sweden, in the province of Smaland, where a gold mine was discovered in 1731.

ALSINA, in botany, a synonime of the theligonum. See THELIGONUM.

ALSINASTRUM, in botany, the trivial name and also a synonime of the elatine. See ELATINE.

ALSINE, or CHICKWEED: A genus of the trigynia order, belonging to the pentandria class of plants; and, in the natural method, ranking under the 22d order, *Caryophyllei.* The characters are: The *calyx* is quinquephyllous: The *corolla* consists of five equal petals, longer than the calyx: The *stamina* consist of five capillary filaments; the antheræ are roundish: The *pistillum* has an oval germen, three filiform styli, and obtuse stigmata: The *pericarpium* is an ovate unilocular capsule, with three valves: The *seeds* are roundish and numerous. Of this genus a great number of species are enumerated by some botanical writers; but none of them possess any remarkable properties, except the media, or common chickweed, with white blossoms, which is so well known as to need no particular description.—This species affords a notable instance of what is called the *sleep of plants*: for, every night, the leaves approach in pairs, so as to include within their upper surfaces the tender rudiments of the new shoots; and the uppermost pair but one at the end of the stalk are furnished with longer leaf-stalks than the others; so that they can close upon the terminating pair, and protect the end of the branch. The young shoots and leaves, when boiled, can hardly be distinguished from spring spinach. They are deemed refrigerating and nutritive, and an excellent food for persons of a consumptive habit of body.—Swine are extremely fond of chickweed; cows and horses eat it; sheep are indifferent to it; and goats refuse it.

ALSIRAT, in the Mahometan theology, denotes a bridge laid over the middle of hell, finer than a hair, and sharper than the edge of a sword, over which people are to pass, after their trial, on the day of judgement. To add to the difficulty of the passage, Mahomet assures, that the alsirat, narrow as it is, is beset with briars and thorns; none of which, however, will be any impediment to the good, who shall fly over it like the wind; Mahomet and his mussulmen lead the way; whereas the wicked, by the narrowness of the path, the entangling of the thorns, and extinction of the light which directed the former to paradise, will soon miss their footing, and tumble headlong into hell, which is gaping beneath to receive them.

ALSIUM, a city of ancient Etruria, occupying (according to Culverius) the spot on which *Pala* now stands. We are told by Dionysius Halicarnassensis, that Alsium was built by the Aborigines, long before the Tyrsenians invaded Italy. In this case it must have been founded not long after the dispersion in the days of Peleg. Its founder is said to have been one *Alæsus*, *Alesus*, or *Alisa*; whom some conjecture to have been Alisah, or Elisha, the son of Javan mentioned in scripture.

ALSOP (Anthony), a divine and poet, was educated at Westminster-school, and thence elected to Christ-church, Oxford, where he took the degree of M. A. in March 1696, and of B. D. in Decem. 1706. On his coming to the university, he was very soon distinguished by Dean Aldrich, and published *Fabularum Æsopicarum Delectus*, Oxon. 1698, 8vo. with a poetical dedication to lord viscount Scudamore, and a preface in which he took part against Dr Bentley in the famous dispute with Mr Boyle. He passed through the usual offices in his college to that of censor with considerable reputation; and for some years had the principal noblemen and gentlemen belonging to the society committed to his care. In this employment he continued till his merit recommended him to Sir Jonathan Trelawney, bishop of Winchester, who appointed him his chaplain, and soon after gave him a prebend in his own cathedral, together with the rectory of Brightwell in the county of Berks, which afforded him ample provision for a learned retirement, from which he could not be drawn by the repeated solicitations of those who thought him qualified for a more public character and a higher station. In 1717 an action was brought against him by Mrs Elizabeth Astrey of Oxford, for a breach

breach of a marriage-contract; and a verdict obtained against him for 2000l. which probably occasioned him to leave the kingdom for some time. His death, which happened June 10, 1726, was occasioned by his falling into a ditch that led to his garden-door. A quarto volume was published in 1752, under the title of *Antonii Alsopi, Ædis Christi olim Alumni Odarum libri duo.* Four English poems of his are in Dodsley's Collections, one in Pearch's, several in the early volumes of the Gentleman's Magazine, and some in "The Student." Mr Alsop is respectfully mentioned by the facetious Dr King of the Commons (vol. I, p. 236), as having enriched the commonwealth of learning, by "Translations of Fables from Greek, Hebrew, and Arabic;" and not less detractingly by Dr Bentley, under the name of "Tony Alsop, a late editor of the Æsopean Fables."

ALSOP (Vincent), an eminent divine, was educated in St John's College in Cambridge, where he took the degree of Master of Arts. He received deacon's orders from a bishop, after which he went down into Rutlandshire, and settled at Oakham, where he was an assistant to the master of the free-school. As he was a man of a sprightly turn, he fell there into indifferent company; but was reclaimed by the frequent admonitions of the reverend Mr Benjamin King. He afterwards married that gentleman's daughter, and becoming a convert to his principles, received ordination in the Presbyterian way, not being satisfied with that which he had from the bishop. He was settled at Wilbee in the county of Northampton, whence he was ejected in 1662, for nonconformity. After this he ventured to preach sometimes at Oakham, and at Wellingborough where he lived, and was once six months in prison for praying by a sick person. A book he wrote against Dr Sherlock in a humorous style, made him well known to the world, and induced Mr Cawton, an eminent nonconformist in Westminster, to recommend him to his congregation for his successor. On receiving this call, he quitted Northamptonshire and came to London, where he preached constantly, and wrote several pieces which were extremely well received by the public. His living in the neighbourhood of the court exposed him to many inconveniences; but these ended with the reign of Charles II, or at least in the beginning of the next reign, when Mr Alsop's son engaging in treasonable practices was freely pardoned by king James. After this our divine went frequently to court, and is generally supposed to have been the person who drew the Presbyterian's address to that prince for his general indulgence. After the revolution, Mr Alsop gave very public testimonies of his affection for the government; yet upon all occasions he spoke very respectfully of king James, and retained a very high sense of his clemency in sparing his only son. The remainder of his life he spent in the exercise of his ministry, preaching once every Lord's day; besides which he had a Thursday lecture, and was one of the lecturers at Pinner's hall. He lived to be a very old man, and preserved his spirits to the last. On grave subjects he wrote with a becoming seriousness; but where wit might properly be shown, he displayed his to great advantage. His funeral sermon preached by Mr Slater, and his memory will be always preserved by his own learned and elegant writings. Of these the most remarkable, besides his sermons, are, 1. *Antisozzo*; in vindication of some great truths opposed Dr by William Sherlock, 8vo, 1675. 2. *Melius Inquirendum*; in answer to Dr Goodman's Compassionate Inquiry, 8vo, 1679. 3. The Mischief of Impositions; in answer to Dr Stillingfleet's Mischief of Separation, 1680. 4. A Faithful Reproof to a False Report, with reference to the Differences among the United Ministers in London, 8vo.

ALSTEDIUS (John-Henry), a German Protestant divine, and one of the most indefatigable writers of the 17th century. He was some time professor of philosophy and divinity at Herborn in the county of Nassau: from thence he went into Transylvania, to be professor at Alba Julia: where he continued till his death, which happened in 1638, being then 50 years of age. His *Encyclopedia* has been much esteemed even by the Roman Catholics; it was printed at Lyons, and sold very well throughout all France. His *Thesaurus Chronologicus* is by some esteemed one of his best works, and has gone thro' several editions. He also wrote *Triumphus Biblicus*, to show that the principles of all arts and sciences are to be found in the Scriptures; but he gained very few to his opinion. He was a Millenarian; and published, in 1627, a treatise *De mille annis*, in which he asserted that the reign of the saints on earth was to begin in 1694.

ALSTON-MORE, a town in Cumberland, seated on a hill; at the bottom of which runs the river Tyne, with a stone bridge over it. Near this place is plenty of lead-ore. W. Long. 2. 4. N. Lat. 54. 45.

ALSTONIA, in botany; a genus of the monogynia order, belonging to the hexandria class of plants. The characters are: The *calyx* is a perianthium beneath, imbricated: The *corolla* is monopetalous, and shorter than the calyx; the border expanding, eight or ten parted, with alternate divisions: The *stamina* consist of numerous short filaments, the exterior ones longer; the antheræ are orbicular and furrowed: The *pistillum* has a small ovate germen above; a simple stylus the length of the corolla, filiform and erect; the stigma inverse egg-headed. There is but one species, the theaformis, a native of America.

ALSTROEMERIA, in botany: A genus of the monogynia order, belonging to the hexandria class of plants; and, in the natural method, ranking under the 11th order, *Sarmentaceæ*. The characters are: There is no *calyx*: The *corolla* is nearly bilabiated; and consists of six petals, the two inferior tubular at the base: The *stamina* consist of six subulated filaments, declining and unequal; the antheræ oblong: The *pistillum* has an hexangular germen beneath; the stylus declining, filiform, the length of the stamina; and three oblong bifid stigmata: The *pericarpium* is a roundish hexangular capsule, with three cells and three valves: The *seeds* are globular and numerous. There are five species, natives of Italy and Peru.

ALT, in music, a term applied to the high notes in the scale.

ALTAIC CHAIN, a range of mountains which bounds Asia on the south. It begins at the vast mountain Bogdo, passes above the head of the Irtisch, and then takes a course rugged, precipitous, clothed with snow, and rich in minerals, between the Irtisch and Ob;

Altamont || Altar.

Ob; then proceeds by the lake Telezkoi, the rise of the Ob; after which it retires, in order to comprehend the great rivers which form the Jenesei, and are locked up in these high mountains; finally, under the name of the *Saianes*, is uninterruptedly continued to the lake of Baikal. A branch insinuates itself between the sources of the rivers Onon and Ingoda, and those of Ichikoi, accompanied with very high mountains, running without interruption to the north-east, and dividing the river of Amur, which discharges itself into the east, in the Chinese dominions, from the river Lena and Lake Baikal. Another branch stretches along the Olecma, crosses the Lena below Jakoutsk, and is continued between the two rivers Tongouska to the Jenesei, where it is lost in wooded and morassy plains. The principal chain, rugged with sharp pointed rocks, approaches and keeps near the shores of the sea of Ockhozt, and passing by the sources of the rivers Outh, Aldan, and Maia, is distributed in small branches, which range between the eastern rivers which fall into the Icy Sea: besides two principal branches, one of which, turning south, runs through all Kamtschatka, and is broken, from the cape Lopatka, into the numerous Kurile isles, and to the east forms another marine chain, in the islands which range from Kamtschatka to America; most of them, as well as Kamtschatka itself, distinguished by fierce volcanoes, or the traces of volcanic fires. The last chain forms chiefly the great cape Tschutski, with its promontories and rocky broken shores.

ALTAMONT, a very handsome town in Italy, in the kingdom of Naples, and in Calabria Citerior, 15 miles north-west of Basigniano. E. Long. 16. 22. N. Lat. 30. 40.

ALTAMURA, a town of Naples, in the territory of Bari, with the title of a principality, seated on the foot of the Apennine mountains. E. Long. 16. 54. N. Lat. 41. 0.

ALTAR, a place upon which sacrifices were anciently offered to some deity.

The heathens at first made their altars only of turf; afterwards they were made of stone, of marble, of wood, and even of horn, as that of Apollo in Delos.

Altars differed in figure as well as in materials. Some were round, others square, and others triangular. All of them were turned towards the east, and stood lower than the statues of the gods; and were generally adorned with sculpture, representing either the gods to whom they were erected, or their symbols. See the PAGAN ALTARS represented on Plate XI. Upon the sides of N° 1. a trident and two dolphins are exhibited, which denote it to have been dedicated to Neptune. N° 2. a four square altar, was dedicated to the nymphs, as the inscription imports. N° 3. exhibits a Bacchanal holding a thyrsus in his hand, a mark of the altar's being built to Bacchus: it had two other sides, which made it appear triangular. Of N° 4. which was also triangular, each face or side exhibited a genius, one of whom (on the side represented) caries an oar upon his neck, which seemed to denote it an altar of Neptune. N° 5. an altar of a round shape, is inscribed *Ara Neptuni*: the god himself is there represented, all naked, saving the pallium upon his shoulder; and holding in his left hand a trident, and in his right a dolphin.

The height of altars also differed according to the different gods to whom they sacrificed. According to Servius, those altars set apart for the honour of the celestial gods, and gods of the higher class, were placed on some pretty tall pile of building; and for that reason were called *altaria*, from the words *alta* and *ara*, "a high elevated altar." Those appointed for the terrestrial gods were laid on the surface of the earth, and called *aræ*. And, on the contrary, they dug into the earth and opened a pit for those of the infernal gods, which they called βοθροι λακκοι, "scrobiculi." But this distinction is not every where observed: the best authors frequently use *ara* as a general word, under which are included the altars of the celestial and infernal, as well as those of the terrestrial, gods. Witness Virgil, Ecl. 5.

——*En quatuor aras.*

Where *aræ* plainly includes *altaria*; for whatever we make of Daphnis, Phœbus was certainly a celestial god. So Cicero, pro Quint. *Aras delubraque Hecates in Græcia vidimus.* The Greeks also distinguished two sorts of altars; that whereon they sacrificed to the gods was called βωμος, and was a real altar, different from the other whereon they sacrificed to the heroes, which was smaller, and called εσχαρα. Pollux makes this distinction of altars in his Onomasticon; he adds, however, that some poets used the word εσχαρα for the altar whereon sacrifice was offered to the gods. The Septuagint version does sometimes also use the word εσχαρα for a sort of little low altar, which may be expressed in Latin by *craticula*; being a hearth rather than an altar.

Before temples were in use, altars were erected sometimes in groves, sometimes in the highways, and sometimes on the tops of mountains; and it was a custom to engrave upon them the name, ensign, or character, of the deity to whom they were consecrated.

In the great temples of ancient Rome there were ordinarily three altars: The first was placed in the sanctuary, at the foot of the statue of the divinity, upon which incense was burnt and libations offered; the second was before the gate of the temple, and upon it they sacrificed the victims; and the third was a portable altar, upon which was placed the offering and the sacred vessels.

Besides these uses of altars, the ancients swore upon them, and swore by them, in making alliances, confirming treaties of peace, and other solemn occasions. Altars also served as places of refuge to all those who fled to them, whatever crime they had committed.

Altars are doubtless as ancient as sacrifices themselves; consequently their origin is not much later than that of the world; Gen. ch. iv. Some attribute their origin to the Egyptians; others to the Jews; others to the patriarchs before the flood. Some carry them as far back as Adam, whose altar is much spoken of by Jewish, and even Christian writers. Others are contented to make the patriarch Enoch the first who consecrated a public altar. Be this as it will, the earliest altars we find any express testimony of are those erected by Abraham.

Altars, in the patriarchal times, were very rude. The altar which Jacob set up at Beth-el was nothing but a stone, which served him instead of a bolster; that of Gideon, a stone before his house: and the first which

Altar. God commanded Moses to erect was probably of earth, or unpolished stones, without any iron; for if any use was made of that metal, the altar was declared impure.

The principal altars of the Jews were, The altar of *incense*; that of *burnt-offering*; and the *altar*, or *table, for the shew-bread*.

The *altar of incense* was a small table of shittim-wood, covered with plates of gold, of one cubit in length, another in width, and two in height. At the four corners, were four kinds of horns, and all round a little border or crown over it. This was the altar hidden by Jeremiah before the captivity; and upon it the officiating priest offered, every morning and evening, incense of a particular composition. See Plate XI.

The *altar of burnt-offerings* was made of shittim-wood, and carried upon the shoulders of the priests by staves of the same wood overlaid with brass. In the time of Moses, this altar was five cubits square and three high; but in Solomon's temple it was much larger, being 20 cubits square and 10 in height. It was covered with brass; and at each corner was a horn or spire, wrought out of the same wood with the altar, to which the sacrifices were tied. Within the hollow was a grate of brass, on which the fire was made; through it fell the ashes, and were received in a pan below. At the four corners of the grate were four rings and four chains, which kept it up at the horns. This altar was placed in the open air, that the smoke of the burnt-offerings might not sully the inside of the tabernacle. See Plate XI.

The *altar*, or *table*, for the *shew-bread*, was likewise of shittim-wood, covered with plates of gold, having a little border round it, adorned with sculpture. It was two cubits long, one wide, and one and an half in height. Upon this table, which stood in the holy of holies, were put, every sabbath-day, 12 loaves, with salt and incense.

The Jewish altars, after their return from the captivity, and the building of the second temple, were in some respects different from those described above. That of burnt-offerings was a large pile, built of unhewn stone, 32 cubits square at the bottom, and 24 square at the top. The ascent was by a gentle rising, 32 cubits in length, and 16 in breadth.

ALTAR, is also used among Christians for the communion-table.

In the primitive church, the altars were only of wood; as being frequently to be removed from place to place. But the council of Paris, in 509, decreed that no altar should be built but of stone.—At first there was but one altar in each church; but the number soon increased; and from the writings of Gregory the Great, who lived in the sixth century, we learn; that there were sometimes in the same church 12 or 13. In the cathedral of Magdeburg there are no less than 49 altars.

The altar is sometimes sustained on a single column, as in the subterraneous chapels of St Cecilia, at Rome, &c.; and sometimes by four columns, as the altar of St Sebastian of Crypta Arenaria; but the customary from is, to be a massive of stone-work, sustaining the alar-table. These altars bear a resemblance to tombs: to this purpose, we read in church history, that the primitive Christians chiefly held their meeting at the tombs of the martyrs, and celebrated the mysteries of religion upon them for which reason, it is a standing rule to this day in the church of Rome, never to build an altar, without inclosing the relics of some saint in it.

Altar-thane | Altenburg.

ALTAR-THANE, or ALTARIST, in old law-books, an appellation given to the priest or parson of a parish, to whom the altarage belonged. See ALTARAGE.

ALTARAGE, in law, altars erected in virtue of donations before the Reformation, within a parochial church, for the purpose of singing of mass for deceased friends.

ALTARAGE likewise signifies the profits arising to the priest on account of the altar.

AL-TAYEFF, a town of Hajaz, a district of Arabia Felix. It is situated about 60 miles east of Mecca, behind mount Gazwan, where the cold is more intense than in any other part of the district, but the air very wholesome. Its territory abounds in fountains, and produces excellent raisins. The town is surrounded with a wall but is not very large.

ALTDORF, a large handsome town in Swisserland, and the chief of the canton of Uri. It is situated below the lake of the four cantons, in a plain, at the foot of a mountain, whose passages are difficult, and serve instead of fortifications. It has four churches and two convents; St Martin's church and that of the Holy Cross are the finest. The town-house, and the arsenal are also worth seeing. E. Long. 8. 30. N. Lat. 46. 50.

ALTEA, a sea-port town of Valencia, in Spain. It was taken in 1705, in favour of the archduke Charles; but lost after the battle of Almanza. W. Long. 0. 15. N. Lat 46. 34.

ALTEMBURG, a town of Transylvania, 17 miles S. W. of Wisemburg, and 35 S. of Clausenbourg. E. Long. 23. 5. N. Lat. 46. 25.

ALTENA, a sea-port town of Germany, in the duchy of Holstein, in Lower Saxony. It is a modern town, built by the king of Denmark, and was burnt by the Swedes in 1712; but has since been beautifully rebuilt. The merchandise brought from Asia, by the Danish East-India company is sold here. E. Long. 10. 0. N. Lat. 53. 51.

ALTENBERG, an ancient town in Germany, situated on the river Pleiss, with a good castle placed on a rock, in Misnia, in the circle of the Upper Saxony. It was formerly an Imperial city, but a present belongs to the house of Saxony. Here is a college which has always been in a flourishing condition. In 1705, there was a nunnery founded for women of high rank, who are Protestants. E. Long. 15. 8. N. Lat. 50. 59.

ALTENBURG, a small fortified town of Hungary, in the territory of Moson, near the Danube, about 55 miles from Vienna. E. Long. 35. 30. N. Lat. 48. 15.

ALTENBURG, or OWAR, a small but strong town of Hungary seated in a marsh, with wide streets. It is near the river Danube, and is surrounded with deep ditches. It is 15 miles south of Presburg, 40 south-east of Vienna, and 65 south-west of Buda. E. Long. 17. 56. N. Lat. 44. 0.

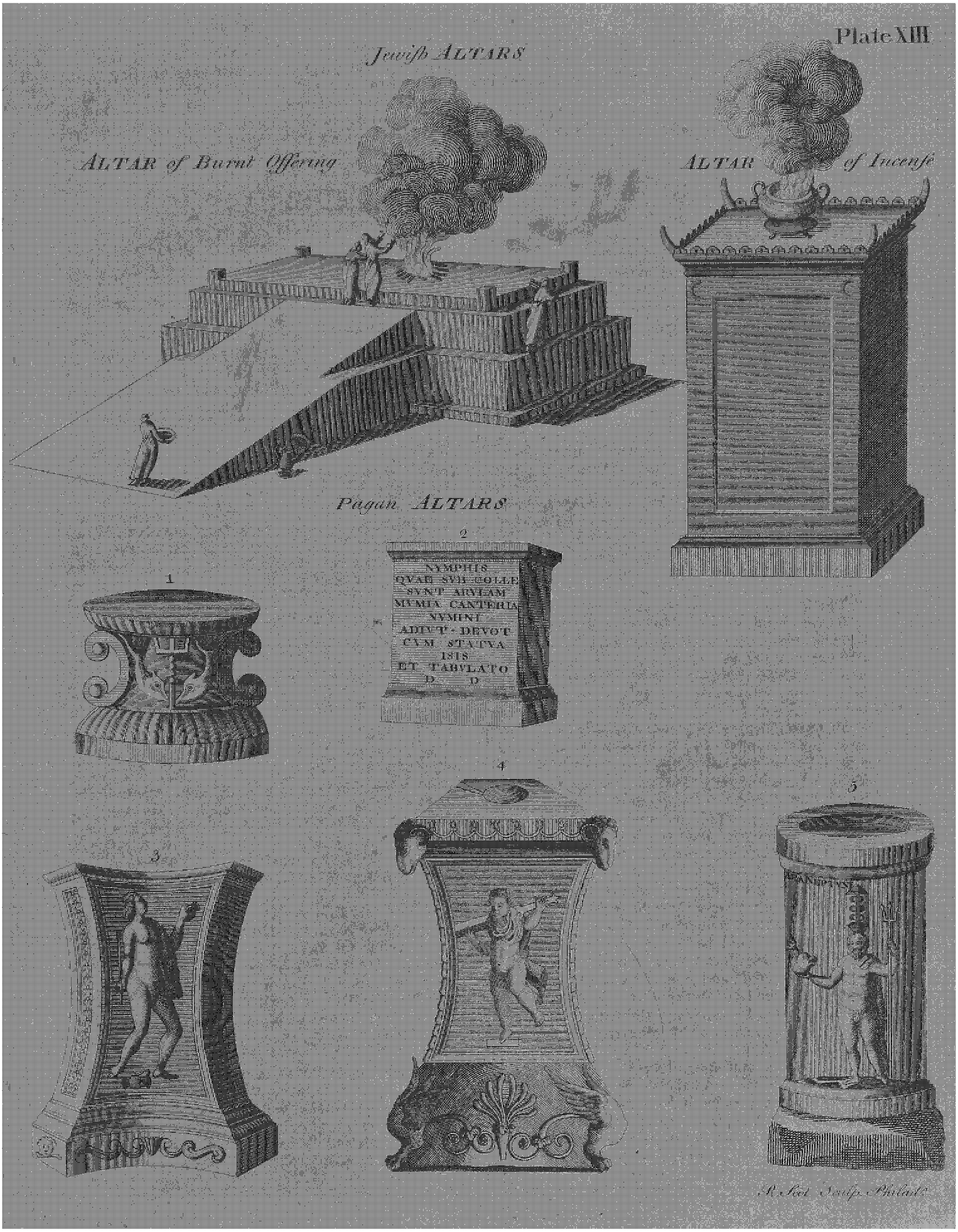


Plate XIII
Jewish ALTARS
ALTAR of Burnt Offering
ALTAR of Incense
Pagan ALTARS
1
2
NYMPHIS
QVAE SVB COLLE
SVNT ARVLAM
MVMIA CANTERIA
NVMINI
ADIVT · DEVOT
CVM STATVA
ISIS
ET TABVLATO
D D
3
4
5
R. Scot Sculp. Philad.

ALTERANTS, or ALTERATIVE *Medicines*, such as correct the bad qualities of the blood and other humours, without occasioning any sensible evacuation.

ALTERATION, in physics, the act of changing the circumstances and manner of a thing; its general nature and appearance remaining the same. Or, it is an accidental and partial change in a body; without proceeding so far as to make the subject quite unknown, or to take a new denomination thereupon.—Or, it may be defined, the acquisition or loss of such qualities as are not essential to the form of the body. Thus, a piece of iron, which before was cold, is said to be *altered*, when it is made hot; since it may still be perceived to be iron, is called by that name, and has all the properties thereof. By this *alteration* is distinguished from *generation* and *corruption*; these terms expressing an acquisition or loss of the essential qualities of thing.—The modern philosophers, after the ancient chemists and corpuscularians, hold all *alteration* to be effected by means of local motion. According to them, it always consists either in the emission, accession, union, separation, or transposition, of the component particles.

ALTERCATION, a debate or contest between two friends or acquaintance. The word comes from *altercari*, which anciently signified to converse or hold discourse together.—Thus, we say, They never come to an open quarrel, but there is continually some little *altercation* or other.

ALTERN-BASE, in trigonometry, a term used in contradistinction to the true base. Thus in oblique triangles, the true base is either the sum of the sides, and then the *difference* of the sides is called the *altern-base*; or the true base is the difference of the sides, and then the *sum* of the sides is called the *altern-base*.

ALTERNATE, in a general sense, a term applied to such persons or things as succeed each other by turns. Thus, two who command each his day, are said to have an alternate command, or to command alternately.

ALTERNATE, in heraldry, is said in respect of the situation of the quarters. Thus the first and fourth quarters, and the second and third, are usually of the same nature, and are called *alternate quarters*.

ALTERNATE, in botany, when the leaves or branches of plants arise higher on opposite sides alternately.

ALTERNATION, in its primary sense, denotes a succession by turns.

ALTERNATION is sometimes used to express the different changes or alterations of orders in any number of things proposed. This is also called *permutation*, &c. and is easily found by a continual multiplication of all the numbers, beginning at unity. Thus, if it be required to know how many changes or alternations can be rung on six bells, multiply the numbers 1, 2, 3, 4, 5, 6, continually into one another; and the last product gives the number of changes.

ALTERNATIVE, is particularly used for the choice of two things proposed. In this sense we say, to take the *alternative* of two propositions.

ALTHÆA, MARSHMALLOW: A genus of the polyandria order, belonging to the monodelphia class of plants; and, in the natural method, ranking under the 37th order, *Columniferæ*. The characters are: The *calyx* is a double perianthium, the exterior one nine-cleft: The *corolla* consists of five petals, coalesced at the base: The *stamina* consist of numerous filaments inserted into the corolla; the antheræ are kidney-shaped. The *pistillum* has an orbicular germen; a short cylindrical stylus; and numerous bristly stigmata, the length of the stylus: The *pericarpium* consists of numerous arillæ: The *seeds* are solitary, and kidney-shaped. There are three

Species. 1. The vulgaris, or common marshmallow, is a native of Britain, and hath a perennial root, and an annual stalk, which perishes every autumn. The stalks grow erect to the height of four or five feet. These are garnished with leaves which are hoary, soft to the touch, and placed alternately on the branches. The flowers come out from under the wings of the leaves, like the mallow, and are of a purplish white. 2. The hirsuta, or hairy marshmallow, is a native of Spain and Portugal. It is a low plant, whose branches trail on the ground, unless they are supported by stakes. The leaves and stalks are beset with strong hairs, the flowers come out like those of the common sort, but are smaller, and have purplish bottoms. 3. The cannabina, or shrubby marshmallow, is a native of Hungary and Istria. It has a woody stem, which rises to the height of four or five feet; and puts out many side-branches. The flowers come out in the same manner as in the others, but are of a deeper red colour. This sort seldom flowers the first year, unless the summer proves warm; but when the plants live through the winter, they will flower early in the following summer, and produce good seeds.

Culture. Though the first sort is found naturally in salt marshes, it will thrive when transplanted into any soil, or in any situation; however, it will always grow larger in moist than in dry soil. It may be propagated either by parting the roots in autumn when the stalks decay, or by sowing the seeds in the spring. If the seeds of the second species are sown in April, the plants will flower in July, and carry ripe seed in September. They ought to be sown in the places where they are to remain, as the roots shoot deep in the ground; so that unless the plants are removed very young, they seldom survive it. The seeds of the cannabina ought also to be sown where the plants are to remain, for the reason just now given. They should have a sheltered situation and dry soil, otherwise they will not live through the winter. Indeed they seldom continue in Britain above two years, with all the care that can be taken of them.

Medicinal Uses. The first is the only species used in medicine. The whole plant, especially the root, abounds with a mild mucilage. It has the general virtues of an emollient medicine; and proves serviceable in a thin acrimonious state of the juices, and where the natural mucus of the intestines is abraded. It is chiefly recommended in sharp defluctions upon the lungs, hoarseness, dysenteries; and likewise in nephritic and calculous complaints: not, as some have supposed, that this medicine has any peculiar power of dissolving or expelling the calculus; but as, by lubricating and relaxing the vessels, it procures a more free and easy passage. The root is sometimes employed externally for softening and maturating hard tumours; chewed, it is said to give ease in difficult dentition of children.

This root gave name to an officinal syrup, decoction,

tion, and ointment; and was likewise an ingredient in the compound powder of gum tragacanth and the oil and plaster of mucilages. But of all these formulæ the syrup alone is now retained.

Althæa Frutex. See Hibiscus.

ALTIMETRY, the art of measuring altitudes or heights, whether accessible or inaccessible. See Geometry.

ALTIN, a money of account in Muscovy, worth three *copecs*; one hundred of which make a ruble, worth about 4s. 6d. sterling.

ALTIN, a lake in Siberia, from whence issues the river Ob, or Oby, in N. Lat. 52. 0. E. Long. 85°. 55′. This lake is called by the Russians *Teloskoi Osero*, from the Telessi, a Tartarian nation, who inhabit the borders of it, and who give it the name of *Altin-Kul*. By the Calmucks it is called *Altinnor*. It is near ninety miles long and 50 broad, with a rocky bottom. The north part of it is sometimes frozen so hard as to be passable on foot, but the southern part is never covered with ice. The water in the Altin lake, as well as in the rivers which run through the adjacent places, only rises in the middle of summer, when the snows on the mountains are melted by the heat of the sun.

ALTINCAR, among mineralists, a species of factitious salt used in the fusion and purification of metals.

The altincar is a sort of flux powder. Divers ways of preparing it are given by Libavius.

ALTING (Henry), professor of divinity at Heidelberg and Groningen, was born at Embden in 1583, of a family which had been long conspicuous in Friseland. His father, Menso Alting, was the first, who, with two others, preached the reformation in the territory of Groningen, about the year 1566, under the tyrannical government of the duke of Alva; and the first that preached in the great church of Groningen, after the reduction of that town by the States General in 1594. Henry was chosen, in 1605, preceptor to the three young counts of Nassau, Solms, and Izenberg. After various difficulties, he settled at Groningen, where he continued till his death, August 25. 1644. He was a sound protestant divine, a pious Christian, a useful member of society in many respects, and one who suffered much for the truth. Most of his works were never published; those which have been are the following: *Notæ in decadem problematum J. Behm*, 1618. *Loci communes explicatio catecheseos Palatinæ*, 1646, in 3 vols. *Exegesis Augustanæ confess.* 1647. *Methodus theologiæ*, 1650. It appears from the catalogue of his works annexed to his life, that the *Medulla hist. prophanæ*, published by Dr Pareus, was composed by Alting. The most remarkable piece among Alting's MS. is, The ecclesiastical history of the Palatinate, from the reformation to the administration of John Casimir.

Alting (James), son of the former, was born at Heidelberg in 1618. He travelled into England in 1640, where he was ordained by the learned Dr Prideaux, bishop of Worcester. He afterwards accepted of the professorship of Groningen, vacant by the death of Gomarus; but his situation was rendered very disagreeable by the continual disputes which he had with his colleague Sam. des Marets, who favoured the school-divinity. He died in 1697. He recommended the edition of his works to Menso Alting (author of *Notitia German. Infer. Antiquæ*, fol. Amst. 1679); but they were published in 5 vols. folio, with his life, by Mr Bekker of Amsterdam. They contain various analytical, exegetical, practical, problematical, and philosophical tracts, which show his great industry and knowledge. Alting was a divine greatly addicted to the text of the scripture, to Cocceianism, and Rabbinism. He preached well in German, Dutch, and English.

ALTITUDE, accessible, and inaccessible. See Geometry.

The method of taking considerable terrestrial altitudes, of which those of mountains are the greatest, by means of the barometer, is very easy and expeditious. It is done by observing, on the top of the mountain, how much the mercury has fallen below what it was at the foot of the mountain. See Barometer.

Altitude of the Eye, in perspective, is a right line let fall from the eye, perpendicular to the geometrical plane.

Altitude, in astronomy, is the distance of a star, or other point, in the mundane sphere, from the horizon.

This altitude may be either *true* or *apparent*.—If it be taken from the rational or real horizon, the altitude is said to be true or real; if from the apparent or sensible horizon, the altitude is apparent.—Or rather, the apparent altitude is such as it appears to our observation; and the *true* is that from which the refraction has been subtracted.

The true altitudes of the sun, fixed stars, and planets, differ but very little from their apparent altitudes; because of their great distance from the centre of the earth, and the smallness of the earth's semidiameter, when compared thereto. But the difference between the true and apparent altitude of the moon is about 52. This subject is further explained under Astronomy.

Altitude Instrument, or *Equal Altitude Instrument*, is that used to observe a celestial object when it has the same altitude on the east and west sides of the meridian. See Astronomy, the last section.

ALTKIRK, a town of Alsace in Germany, situated on the river Ill, in N. Lat. 47. 40. and E. Long. 7. 15.

ALTMORE, a town of Ireland, in the county of Tyrone, and province of Ulster, situated in N. Lat. 54. 34, and W. Long 7. 2.

ALTON, a town in Hampshire, seated on the river Wey; W. Long. 0. 46. N. Lat. 51. 5. It is governed by a constable; and consists of about 300 houses, indifferently built, chiefly laid out in one pretty broad street. It has one church, a Presbyterian, and a Quaker meeting, a famous free school, a large manufacture of plain and figured baragons, ribbed druggets, and serges de Nismes; and round the town is a large plantation of hops.

Alton, or Avelton, a village in Staffordshire, five miles north of Utoxeter. There are the ruins of a castle here, which some would have to be built before the Norman conquest; but Dr Plott is pretty certain that it was erected by Theobald de Verdun, in the beginning of the reign of Edward II. A great part of the walls are still standing, but they are in a very ruinous condition.

ALTO *et Basso*, or *in Alto & in Basso*, in law, signifies

signifies the absolute reference of all differences, small and great, high and low, to some arbitrator or indifferent person.—*Pateat universis per præsentes, quod Willielmus Tylar de Yetton, & Thomas Gower de Almestre, posuerunt se in* Alto *& in* Basso, *in arbitrio quatuor hominum;* viz. *de quadam querela pendente inter eos in curia.—Nos & terram nostram* alté & bassé *ipsius domini Regis supposuimus voluntati.*

Alto-Relievo. See Relievo.

Alto-Ripieno, in music, the tenor of the great chorus which sings and plays only now and then in some particular places.

ALTORF, a town of the circle of Franconia, in Germany. It has a physic garden, with 2000 different plants; a theatre for dissections, which has many curiosities in the anatomical way; and a handsome library. It is subject to the house of Brandenburg; and is seated on the confines of Bavaria, 15 miles from Nuremberg. E. Long. 9. 35. N. Lat. 47. 46.

ALT-RANSTADT, a town in Saxony, famous for the treaty between Charles XII. king of Sweden and Augustus elector of Saxony, in 1706, wherein the latter resigned the kingdom of Poland.

ALTRINGHAM, a town of Cheshire in England, upon the borders of Lancashire, seven miles from Manchester. W. Long. 1. 30. N. Lat. 53. 25.

ALTZEG, a town of Germany in the Lower Palatinate, the capital of a territory of the same name, with an old castle. W. Long. 7. 25. N. Lat. 49. 44.

ALVA de Tormes, a considerable town in Spain, in the kingdom of Leon, and territory of Salamanca, with a very handsome castle. It is seated on the north bank of the river Tormes. W. Long. 6. 1. N. Lat. 41. 0.

ALVAH, the wood wherewith Moses, sweetened the waters of Marah, Exod. ch. xv. ver. 25.—The name of this wood is not found in Scripture; but the Mahometans give it that of *alvah*, and pretend to trace its history from the patriarchs before the flood. Josephus, on the contrary, says, that Moses used the wood which he found next lying before him.

ALVARES de luna, or as some call him Alvaro, is a character too edifying to be omitted in this work. He was the favourite of John II. king of Castile: was famous for the prodigious ascendancy he gained over this prince, and for the punishment which at length overtook him. He was natural son of Don Alvaro de Luna, lord of Canete in Arragon, and of a woman infamous for unbounded lust. He was born in 1388 and named, Peter; but Pope Benedict XIII. who was charmed with his wit tho' yet a child, changed Peter to Alvares. He was introduced to court in 1408, and made a gentleman of the bedchamber to king John, with whom he grew into the highest favour. In 1427 he was obliged to retire: the courtiers exerted all their endeavours to ruin him: they complained, that a man of no military skill, of no virtues whatever, should, by mere artifice and dissimulation, be advanced to the highest authority; and they could not bear that, by the assistance of a few upstart men, whom he had raised and fixed to his interest, he should reign as absolutely as if he were king.

They prevailed against him, and Alvares was banished from court a year and an half: but this was the greatest affliction imaginable to the king; who showed all marks of distress the moment he was removed from his presence, and now thought and spoke of nothing but Alvares. He was therefore recalled; and, being invested with his usual authority, revenged himself severely upon his enemies, by persuading the king to banish them. Of the 45 years he spent at court, he enjoyed for 30 of them so entire an ascendancy over the king, that nothing could be done without his express orders: nay, it is related by Mariana, that the king could not change an officer or servant, or even his clothes or diet, without the approbation of Alvares. In short, he wanted nothing to complete his grandeur but the name of king: he had all the places in the kingdom at his disposal; he was master of the treasury, and by bounties had so gained the hearts of the subjects, that the king, though his eyes now were opened, and his affections sufficiently turned against him, durst not complain.

But the day of reckoning was approaching, and at length he was seized: yet not directly, openly, and violently, but with some of that management which upon a similar occasion was formerly employed by Tiberius against Sejanus. During his confinement, he made several attempts to speak to the king in person; but not being able to effect this, he sent the following letter, from which, as well as from the rest of Alvares's history, all court favourites may draw abundant matter for edification and instruction. "Sir, it is five-"and forty years since I was admitted into your service. I do not complain of the rewards I have received: they were greater than my merits or expectation, as I shall not deny. There was but one thing wanting to complete my happiness; and that was to have fixed proper limits in time to this great fortune of mine. While, instead of choosing retirement, after the example of the greatest men, I still continued in the employment, which I thought not only my duty, but necessary for your interest, I fell into this misfortune. It is very hard that I should be deprived of liberty, when I have risked life and fortune more than once to restore it to you. Grief prevents me from saying more. I know that the Deity is provoked against me by my sins; but it will be sufficient for me, if his anger is appeased by the calamities I now suffer. I can no longer bear that prodigious mass of riches, which it was wrong in me to have heaped together. I should willingly resign them, but that every thing I have is in your power; and I am denied the opportunity of showing mankind, that you have raised a person to the height of greatness, who can contain wealth as well as procure it, and give it back to him from whom he received it. But I desire you in the strongest terms, that, as I was obliged by the lowness of the treasury to raise 10,000 or 12,000 crowns by methods I ought not to have taken, you will restore them to the persons from whom they were extorted. If you will not grant this on account of the services I have done, yet I think it necessary to be done from the reason of the thing."

This letter, however, produced no effect in his favour: Alvares was tried, and condemned to loose his head. After condemnation, he was removed to Valladolid; and, having confessed himself, and received the sacrament, he was carried up on a mule to the market-place, in the middle of which a large scaffold was erected. Mounting the scaffold, he paid reverence to the cross, and presently gave his hat and signet to his page, saying, "These are the last gifts you will ever receive "from me." He then submitted himself to the axe with the utmost intrepidity. Dr Geddes relates, that he was executed the 4th of June, others the 5th of July, 1453.

ALUDELS, in chemistry, are earthen pots without bottoms, inserted into each other, and used in sublimations.

ALVEARIUM, in anatomy, the bottom of the *concha*, or hollow of the outer ear.

ALVEARIUM also signifies a bee-hive. The word is formed of *alveus*, a "channel or cavity;" in allusion to the *alveoli*, or cells in bee-hives.

Some of the ancients use also the word *alvearium* for a bee-house, more usually called among us *apiary*.

ALVEARIUM is sometimes also used figuratively, to denote a collection. In which sense, *alvearium* amounts to much the same with what we otherwise call *thesaurus*, *cornucopia*, or the like. Vinc. Boreus has published an alvearium of law.

ALVEOLUS, in natural history, the name of the waxen cells in bee hives. Also the name of a sea-fossil of a conic figure, composed of a number of cells, like bee-hives, joined into each other, with a pipe of communication.

ALVEOLUS, in anatomy, the sockets in the jaws wherein the teeth are fixed.—Some writers speak of teeth growing without alveoli. Pliny mentions a person who had a tooth in his palate. Eustachius relates, that he saw a man who at 50 had a tooth growing out of the middle of his fauces. Holler gives an instance of a person, whose teeth were of a piece with his jaws, without any insertion into alveoli.

ALUM, in chemistry, a clear and transparent saline matter, usually sold in large masses, of a very austere and astringent taste, useful in medicine and in various arts.

Most of the alum to be met with is artificially prepared by the methods related in their proper place under the article CHEMISTRY, or by others similar to them; though sometimes a small quantity is produced naturally. This native alum is mixed with heterogeneous matters, or effloresces in various forms upon the ores during calcination. It rarely occurs in a crystallized state, though thus it is said to be met with in Egypt, Sardinia, Spain, Bohemia, and other places. It is also found in the waters, impregnated with fixed air, but very seldom in fountains or hot medicated waters.

There are several kinds of alum to be met with; but these differ from one another only in being mixed with some salts which are not of the aluminous kind. That called the Roman alum has been considered as preferable to any other. This is usually met with in small crystals, and has a redish colour, most probably owing to a small quantity of calx of iron, which, however, does not in the least impair its qualities. The other kinds of alum contain a portion either of vitriolated tartar or sal ammoniac, according to the nature of the alkali used in its preparation. Mr Bergman informs us, that the vegetable alkali, if pure, does not hurt the alum, though it be added in the preparation; but that the volatile alkali, by adulterating it with a portion of vitriolic sal ammoniac, renders it unfit for some purposes. The alum, made by adding a portion of clay to the liquor at the beginning of the boiling, he considers as equal, if not superior, to Roman alum. He informs us also, that a kind of alum some time ago began to be manufactured at Brunswick, which was equal in quality to the Roman alum. On a chemical analysis of this alum he found it mixed with cobalt.

This salt is extremely useful in the art of dyeing; as by means of it a great number of colours are fixed and rendered permanent upon cloth, which otherwise would either not adhere in any degree, or only for a very short time. In what manner this is accomplished we are very much ignorant; the conjectures and theories on this subject are related under the article DYEING. It constitutes the basis of crayons, which generally consist of the earth of alum finely powdered and tinged for the purpose. In the preparation of Prussian blue, it prevents the basis of martial vitriol, which is soluble in acids, from being precipitated by the superfluous alkali employed in the preparation of that pigment; that is, the alkali which is not saturated by the colouring matter. As this basis adheres more strongly than the clay to the vitriolic acid, and would form a green by the mixture of its yellowness, the white earth of alum likewise, according to its quantity, dilutes the darker colours, even black itself, and produces an infinite number of shades. It is also of use in the making of candles; for being mixed with the tallow, it gives it an hardness and consistence which it has not naturally. Wood sufficiently soaked in a solution of alum does not easily take fire, and the same is true of paper impregnated with it; which for that reason is very properly employed in preserving gun-powder, as it also excludes the moisture of the air. Paper impregnated with alum is useful in whitening silver, and silvering brass without heat. Alum is also of use in tanning, where it assists in restoring the cohesions of the skins almost entirely destroyed by the lime. Vintners fine down their wines, &c. with alum; fishers use it to dry codfish with; and bakers have mixed it with the flour to make their bread compact and white: to this last use of it great objections have been made, but unjustly, for it is entirely innocent, and now seldom used.

In medicine it is of considerable use as an astringent and tonic. It is reckoned particularly serviceable for restraining hemorrhagies, and immoderate secretions from the blood; but less proper in intestinal fluxes. In violent hemorrhagies, it may be given in doses of 15 or 20 grains, and repeated every hour or half hour till the bleeding abates: in other cases, smaller doses are more advisable; large ones being apt to nauseate the stomach, and occasion violent constipations of the bowels. It is used also externally, in astringent and repellent lotions and collyria. Burnt alum taken internally has been highly extolled in cases of colic. In such instances, when taken to the extent of a scruple for a dose, it has been said gently to move the belly, and give very great relief from the severe pain. Its officinal preparations are, for internal use, *pulvis stypticus*, and *aqua styptica* for external applications, the *aqua aluminis*, and *coagulum aluminis* and *alumen ustum*; which last is no other than the alum dried by fire, or freed from the watery moisture, which, like other salts, it always retains in its crystalline form. By

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this loss of its water it becomes sharper, so as to act as a slight escharotic; and it is chiefly with this intention that it is employed in medicine, being very rarely taken internally. For these preparations, see PHARMACY.

ALUM mines are said to have been first found in Italy in the year 1460; and in 1506 king Henry VII. made a monopolizing grant of this commodity to Augustine Chigi, a merchant of Sienna. In the year 1608 the manufacture of alum was first invented, and successfully practised in England, meeting with great encouragement in Yorkshire, where it was first made, from Lord Sheffield, and other gentlemen of that county. King James I. by advice of his ministry, assumed the monopoly of it to himself, and therefore prohibited the importation of foreign alum; and in 1625 the importation of it was further prohibited by the proclamation of Charles I.

ALUM-works, places where alum is prepared, and manufactured in quantities for sale. They differ from alum-mines, as in the former an artificial alum, and in the latter natural alum, is produced.

ALUNTIUM, ALONTIUM, (anc. geog.) a town in the north of Sicily, situated on a steep eminence, at the mouth of the Chydas; said to be as old as the war of Troy. Now in ruins; from which arose the hamlet *St Filadelfo*, in the Val di Demona. The inhabitants were called *Haluntini*.

ALVUS, in anatomy, a term used for the belly in general, but more frequently applied to the bowels.

ALWAIDII a sect of Mahometans who believe all great crimes to be unpardonable.—The Alwadii stand in opposition to the Morgii. They attribute less efficacy to the true belief in the salvation of men than the rest of the Musselmans.

ALYSSUM, ALLYSON, or ALLYSOIDES, Madwort; (from *αλυσσω, to be mad;* because it was believed to have the property of curing madness): A genus of the filiculosa order, belonging to the tetradynamia class of plants; and, in the natural method, ranking under the 39th order, *Siliquosa*. The characters are: The *calyx* is an oblong four-leaved perianthium: The *corolla* consists of four cruciform petals; with claws the length of the calyx, the petals shorter: The *stamina* consist of six filaments, the length of the calyx; two of them rather shorter and denticulated; the antheræ are erect and expanding: The *pistillum* has an ovate germen; the stylus is simple, and the length of the stamina; the stigma is obtuse: The *pericarpium* is a sub-globular emarginated silicle, furnished with a bilocular stylus, having an elliptic partition: the *seeds* are few, orbicular, and affixed to filiform receptacles.

Species. Of this genus, Linnæus enumerates 19 species; but none of them are remarkable either for beauty, or any other property, except the halimifolium, or madwort with whole spear-shaped leaves. This spreads itself upon the ground, and never rises to any height. It produces, at the extremity of its branches, very pretty tufts of small white flowers; of which it is seldom destitute for six or seven months successively; for which reason it well deserves a place in the gardens of the curious.

Culture. Though these plants are natives of the southern parts of Europe; yet, if planted on a dry, lean, or rubbishy soil, they will endure the severest winters in the open air.—The halimifolium seldom continues above two or three years, and must therefore be often sown to preserve it; or if the seeds are suffered to fall, the plants will rise without any trouble. It may also be propagated by cuttings, which ought to be planted in April or May, and are very apt to take root, if kept shaded in the heat of the day, and gently refreshed with water.

This plant, as already observed, was thought to cure some kinds of madness; but the present practice has entirely rejected it for this or any other purpose.

ALYTARCHA, a priest of Antioch in Syria, who, in the games instituted in honour of the gods, presided over the officers who carried rods to clear away the crowd and keep order.

In the Olympic games, the Alytarches had the same command, and obliged every person to preserve order and decency.

ALZIRA, a town of Spain, in the kingdom of Valentia, seated on the river Xucar, E. Long. 0. 20. N. Lat. 39. 10.

AMA, in ecclesiastical writers, denotes a vessel wherein wine, water, or the like, were held, for the service of the eucharist. In this sense the word is also written amula; sometimes also hama, and hamula.

AMA is sometimes also used for a wine measure, as a cask, pipe, or the like.

AMABYR, a barbarous custom which formerly prevailed in several parts of England and Wales, being a sum of money paid to the lord when a maid was married within his lordship. The word is old British, and signifies "the price of virginity."

AMADABAT, a corruption from AHMED ABAD or *Ahmed's city*, (so called from a king of that name); a large and populous city of Indostan, and the capital of the province of Guzerat. It is situated in E. Long. 72. 12. N. Lat. 23. 0. Amadabat was formerly called *Guzerat;* and by Shah Jehân nicknamed *Gherd-abád*, or "the habitation of dust," because it was much incommoded therewith. It was the seat of the Guzerat kings, as it is now of the Mogul governor. The city stands in a beautiful plain; and is watered by the little river Sabrimetti, which, though not deep, in time of rains overflows the plains prodigiously. The walls are built with stone and brick, flanked at certain distances with great round towers and battlements. It has twelve gates; and, including the suburbs, is about four miles and an half long. The streets are wide. The *meydân shâh*, or king's square, is 700 paces long and 400 broad, planted round with trees. On the west side is the castle, well walled with free stone, and as spacious as a little city; but its inward appearance is not conformable to its external magnificence. The caravansera is on the south of the square, and its chief ornament. Near the meydan also is the king's palace, whose apartments are richly ornamented: and in the midst of the city is the English factory, where they purchase fine chintz, callicoes, and other Indian merchandize. The place is so full of gardens stored with fruit-trees, that from an eminence it looks like a wood. The Hindoos have here an hospital for sick beasts, and another for sick birds, which they take great care of. According to some late accounts, this city is little inferior to the best in Europe, and is thought to yield ten times as much revenue as Surat.

AMADAN, or HAMADAN, a town of Persia, between Taurus, and Ispahan, E. Long. 47. 4. N. Lat. 35. 15. It is seated at the foot of a mountain, where there are a great many springs, which water the adjacent country. The extent of the city is very large; but there are a great many waste spots within it, as well as cultivated land. The houses are built of brick hardened in the sun, and have but a very indifferent aspect. There is but one tolerable street; and that is where stuffs, garments, and the like, are exposed to sale: it is straight, long, and wide; and the shops are very well furnished. The adjacent parts are fruitful in corn and rice, insomuch that the neighbouring provinces are supplied from hence. It is said to enjoy a very salubrious air, but the cold in winter is intense. The Armenians have a church in this town, but it is a very ill-contrived structure. The Jews have a synagogue near a tomb, where they pretend Esther and Mordecai lie interred. To this place they come in pilgrimage from several parts of the Levant. About a league from Amadan, there is a mountain called *Nalbana*, which abounds with all sorts of curious herbs. In the spring, people flock to this mountain from all parts to recover their health, by sucking in the salutary effluvia with their breath.

Amadan is a very ancient city. It is said to have been destroyed by Nebuchadnezzar, and rebuilt by Darius, who brought hither all his riches. The kings of Persia frequently retired to this place on account of its delightful situation; for which reason it obtained the name of the *Royal city*. It was conquered by the khalif Othman, and narrowly escaped being destroyed by Jenghiz Khan in 1220. It had then strong walls and a good castle, which are now in ruins. Its present beauty consists in its gardens and springs.

AMADANAGER, a town in the hither peninsula of India, in the province of Decan. E. Long. 74. 15. N. Lat. 18. 10.—It was taken by the Moguls in 1598, after a siege of six months; being at that time defended by a strong castle, situated on an eminence, and surrounded with deep ditches, into which sevaral springs discharged their waters.

AMADIA, a trading town of Asia, in Curdistan, belonging to the Turks; seated on a high mountain. E. Long. 43. 1 N. Lat. 36. 25.

AMADOW, a kind of black-match, tinder, or touch-wood, which comes from Germany. It is made of a sort of large mushrooms, or spungy excrescences, which commonly grow on old trees, especially oaks, ash, and firs. This substance being boiled in common water, and afterwards dried and well beaten, is then put into a strong lye prepared with salt-petre, after which it is again put to dry in an oven. The druggists sell this match wholesale in France, and several hawkers retail it. Some give to the amadow the name of *Pyrotechnical Spunge*, because of its aptness to take fire.

AMADOWRY, a kind of cotton which comes from Alexandria, by the way of Marseilles.

AMAIN, in the sea-language, a term importing to lower something at once. Thus, to *strike amain*, is to lower, or let fall, the top-sails; to *wave amain*, is to make a signal, by waving a drawn sword, or the like, as a demand that the enemy strike their top-sails.

AMAC, a small island in the Baltic sea, near Copenhagen, from which it is separated by a canal, over which there is a draw-bridge. Amak is about four miles long and two broad; and is chiefly peopled by the descendants of a colony from East Friesland, to whom the island was consigned by Christian II. at the request of his wife Elizabeth, sister of Charles V. for the purpose of supplying her with vegetables, cheese, and butter. From the intermarriages of these colonies with the Danes, the present inhabitants are chiefly descended; but as they wear their own dress, and enjoy peculiar privileges, they appear a distinct race from the natives. The island contains about six villages, and between 3000 and 4000 souls. It has two churches, in which the ministers preach occasionally in Dutch and Danish. The inhabitants have their own inferior tribunals; but in capital offences are amenable to the king's court of justice at Copenhagen. The old national habit, brought by the original colony when they first migrated to the island, is still in use amongst them. It resembles the habit of the ancient quakers, as represented in the pictures of the Dutch and Flemish painters. The men wear broad-brimmed hats, black jackets, full glazed breeches of the same colour, loose at the knee, and tied round the waist. The women were dressed chiefly in black jackets and petticoats, with a piece of blue glazed cloth bound round their heads. The island is laid out in gardens and pastures; and still, according to the original design, supplies Copenhagen with milk, butter, and vegetables. E. Long. 12. 10. N. Lat. 55. 20.

AMAL, a town of Sweden, in the province of Daland, seated on the river Weser. It has a good harbour; and carries on a great trade, especially in timber, deals, and tar. E. Long. 12. 40. N. Lat. 58. 50.

AMALEK, the son of Eliphaz, by Timna his concubine, and the grandson of Esau. Gen. xxxvi. 12. and 1 Chr. i. 36. Amalek succeeded Gatam in the government of Edom. He was the father of the Amalekites; a powerful people who dwelt in Arabia Petræa, between the Dead Sea and the Red sea, or between Havila and Shur (1 Sam. xv. 7.); sometimes in one canton, and sometimes in another. It does not appear that they had cities: for there is no mention of any but one in the Scriptures (*id. ib* 5.); they living generally in hamlets, caves, or tents.

The Israelites had scarce passed the Red Sea on their way to the wilderness, before the Amalekites came to attack them in the desarts of Raphidim (Ex. xvii. 8, &c.); and put those cruelly to the sword who were obliged, either through fatigue or weakness, to remain behind. Moses, by divine command, directed Joshua to fall upon this people; to record the act of inhumanity which they had committed in a book, in order to have it always before his eyes; and to revenge it in the most remarkable manner. Joshua therefore fell upon the Amalekites, and defeated them while Moses was upon the mountain with Aaron and Hur in company. Moses, during the time of the engagement, held up his hands, to which the success of the battle was owing; for as often as he let them down, Amalek prevailed. But Moses's hands being tired, Aaron and Hur supported his arms, and held them extended, while the battle lasted, which was from morning till the approach of night, when the Amalekites were cut in pieces. This happened in the year of the world 2513, before Christ 1491.

Amalek.

The ground of the enmity of the Amalekites against the Israelites is generally supposed to have been an innate hatred from the remembrance of Jacob's depriving their progenitor both of his birthright and blessing. Their falling upon them, however, and that without any provocation, when they saw them reduced to so low a condition by the fatigue of their march and the excessive drought they laboured under, was an inhuman action, and justly deserved the defeat which Joshua gave them. Under the Judges (v. 3.), we see the Amalekites united with the Midianites and Moabites; in a design to oppress Israel; but Ehud delivered the Israelites from Eglon king of the Moabites (Judges iii.), and Gideon (chap. viii.) delivered them from the Midianites and Amalekites. About the year of the world 2930, Saul marched against the Amalekites, advanced as far as their capital, and put all the people of the country to the sword; but spared the best of all the cattle and moveables, contrary to a divine command; which act of disobedience was the cause of Saul's future misfortunes.

After this war, the Amalekites scarce appear any more in history. However, about the year of the world 2949, a troop of Amalekites came and pillaged Ziklag, which belonged to David (1 Sam. xxx.), where he had left his two wives Ahinoam and Abigail; but he returning from an expedition which he had made in the company of Achish into the valley of Jezreel, pursued them, overtook and dispersed them, and recovered all the booty which they had carried off from Ziklag.

The Arabians maintain Amalek to have been the son of Ham and grandson of Noah; that he was the father of Ad and grand father of Sehedad. Calmet thinks that this opinion is by no means to be rejected; as it is not very probable that Amalek the son of Eliphaz, and grandson of Esau, should be the father of a people so powerful and numerous as the Amalekites were when the Israelites departed out of Egypt. Moses in the book of Genesis (xiv. 7.) relates, that in Abraham's time, long before the birth of Amalek, the son of Eliphaz, the five confederate kings carried the war into Amalek's country, about Kadesh; and into that of the Amorites, about Hazezontamar. The same Moses (Numb. xxiv. 20.) relates, that the diviner Balaam, observing at a distance the land of Amalek, said, in his prophetic style, "Amalek is the first, the head, the original of the nations; but his latter end shall be that he perish for ever." Our commentator observes, that this epithet of the first of nations cannot certainly agree with the Amalekites descended from the son of Eliphaz, because the generation then living was but the third from Amalek. Besides, Moses never reproaches the Amalekites with attacking their brethren the Israelites; an aggravating circumstance which he would not have omitted were the Amalekites descended from Esau; in which case they had been the brethren of the Israelites. Lastly, we see the Amalekites almost always joined in the Scripture with the Canaanites and Philistines, and never with the Edomites; and when Saul made war upon the Amalekites, and almost utterly destroyed them, we do not find that the Edomites made the least motion towards their assistance, nor to revenge them afterwards. Thence it is thought probable, that the Amalekites who are so often mentioned in Scripture were a free people descended from Canaan, and devoted to the curse as well as the other Amorites, and very different from the descendants of Amalek the grandson of Esau.

Amalek, Amalfi.

The accounts which the Arabians give us of the Amalekites destroyed by Saul are as follow. Amalek was the father of an ancient tribe in Arabia, exterminated in the reign of Saul. This tribe contained only the Arabians who are called *Pure;* the remains whereof were mingled with the posterity of Joktan and Adnan, and so became Mosarabes or Mostaarabes; that is to say, Arabians blended with foreign nations. They farther believe, that Goliah, who was overcome by David, was king of the Amalekites; and that the giants who inhabited Palestine in Joshua's time were of the same race. That at last part of the Amalekites retired into Africa while Joshua was yet living, and settled upon the coasts of Barbary, along the Mediterranean sea. The son of Amalek was Ad, a celebrated prince among the Arabians. Some make him the son of Uz, and grandson of Aram the son of Shem. Let this be as it will, the Mahometans say that Ad was the father of an Arabian tribe called *Adites;* who were exterminated, as they tell us, for not hearkening to the patriarch Eber, who preached the unity of God to them. Ad had two sons, Schedad and Schedid.

AMALFI, an ancient city of Italy, situated in E. Long. 15. 20. N. Lat. 40. 35.—It is said to have derived its origin from a number of Roman families, who, about the middle of the fourth century, either from private views of emolument, or in consequence of compulsory orders from the emperor, had left Rome and embarked for Constantinople: but meeting with storms on their passage, were cast away on the shores of Salerno, and deprived of the means of pursuing their voyage. In this state of perplexity they long remained, but at last came to the resolution of settling on the present site of Amalfi, where they expected to enjoy security and sufficient plenty of the necessaries of life. The earliest notice of them in this settlement dates no higher than the latter end of the sixth century. Impervious mountains and inaccessible coasts preserved their infant state from the first fury of the Lombards, who seldom attempted the conquest of a maritime people.

In the year 825, when this little republic had, under the patronage of the eastern emperors, attained a degree of wealth and reputation sufficient to excite the ambition of its neighbours, Sico, prince of Salerno, marched a body of troops by night; surprised Amalfi; and, carrying off the greatest part of the inhabitants, compelled them to fix at Salerno, which had lately suffered a great loss of people by an epidemical disorder. But before the fourth year of their captivity was expired, the Amalfians took advantage of the absence of the Salernian chiefs, who were than carrying on a war with the Beneventans; armed themselves; and, after burning and plundering Salerno, marched in triumph back to their own country.

Here they framed a better system of government, and reformed many abuses in their former legislation; adopting various measures that were likely to promote internal concord and defeat the evil intention of foreign enemies. Their first plan was to vest the supreme authority in a temporary prefect; but the experience of of a few years caused them to prefer lodging that power in the hands of a duke elected for the term of his natural life. Under these governors Amalfi attained the summit of her military and commercial glory. It extended its territory, which reached eastward from Vico Vecchio, and westward to the promontory of Minerva, including likewise the island of Caprea, and the two islands of the Galli. Towards the north it comprehended the cities of Lettere, Gragnans, Pimontio, and Capule di Franchi; towards the south, those of Scala, Ravelli, Minori, Majuri, Atrani, Tramonti, Agerula, Citara, Prajano, and Rosilano.

Leo IV. found the Amalfians an useful ally in his wars with the infidels, and honoured the commonwealth with the title of *Defender of the Faith*. The Neapolitans, with whom, as Greek vassals, they were united in strict bonds of friendship, experienced many signal favours at their hands; and the Mussulmen themselves found it expedient to court their alliance, and to enter into treaty with them. Their situation had from the beginning given them a turn to commerce, and their attention to naval affairs so much consequence in the eyes of their protector, the emperor of Constantinople, that by his orders a court was established at Amalfi for the decision of all controversies arising in maritime transactions. Its code and reports became the general rule in those cases throughout this part of Europe; its precedents and decrees were allowed to be good authority to found judgment upon even in foreign tribunals.—To crown the mercantile and naval glory of the republic, it was reserved to the lot of an Amalfian to make, or at least to perfect, the most important discovery ever made for the improvement of navigation. Pasitano, a village which stands on the shore a few miles west of Amalfi, boasts of having given birth to Flavius Gioia, the inventor of the mariner's compass.

The merchants of this town engrossed the trade of the Levant, and transacted the commercial business of the world in a lucrative and exclusive manner. The Pisans, Venetians, and Genoese, rose upon their ruin; and after monopolizing the emoluments of trade for some ages, made way for the more comprehensive and daring spirit of the present maritime powers.

At present Amalfi is subject to Naples, and is the see of an archbishop. It is but a shadow of what it was in its flourishing state, when it extended over the stupendous rocks that hung on each side, still crowned with battlemented walls and ruined towers. Its buildings, Mr Swinburne says, are not remarkable for elegance or size; and contain at most 4000 inhabitants, who seem to be in a poor line of life. The cathedral is an uncouth building. Under the choir is the chapel and tomb of the apostle St Andrew; to whose honour the edifice was dedicated, when Cardinal Capuano in 1208 brought his body from Constantinople.

AMALGAM, mercury united with some metal.

AMALGAMATION, the operation of making an amalgam, or mixing mercury with any metal.

For the combination of one metal with another, it is generally sufficient that one of them be in a state of fluidity. Mercury being always fluid, is therefore capable of amalgamation with other metals without heat; nevertheless, heat considerably facilitates the operation.

To amalgamate without heat requires nothing more than rubbing the two metals together in a mortar; but the metal to be united with the mercury should be previously divided into very thin plates or grains. When heat is used (which is always most effectual, and with some metals indispensably necessary), the mercury should be heated till it begins to smoke, and the grains of metal made red-hot before they are thrown into it. If it be gold or silver, it is sufficient to stir the fluid with an iron rod for a little while, and then throw it into a vessel filled with water. This amalgam is used for gilding or silvering on copper, which is afterwards exposed to a degree of heat sufficient to evaporate the mercury.

Amalgamation with lead or tin is effected by pouring an equal weight of mercury into either of these metals in a state of fusion, and stirring with an iron rod. Copper amalgamates with great difficulty, and iron not at all.

AMALTHÆA, the name of the Cumæan Sibyl, who offered to Tarquinius Superbus nine books, containing the Roman destinies, and demanded 300 pieces of gold for them. He derided her; whereupon she threw three of them into the fire; and returning, asked the same price for the other six; which being denied, she burnt three more; and returned, still demanding the same price. Upon which Tarquin consulting the pontiffs, was advised to buy them. These books were in such esteem, that two magistrates were created to consult them upon extraordinary occasions.

AMALTHEA, in pagan mythology, the daughter of Melissus, king of Crete, and the nurse of Jupiter, whom she fed with goat's milk and honey. According to others, Amalthea was a goat, which Jupiter translated into the sky, with her two kids, and gave one of her horns to the daughters of Melissus, as a reward for the pains they had taken in attending him. This horn had the peculiar property of furnishing them with whatever they wished for; and was thence called the *cornucopia*, or horn of plenty.

AMALTHÆUS (Jerome, John Baptista, and Cornielle), three celebrated Latin poets of Italy, who flourished in the 16th century. Their compositions were printed at Amsterdam in 1685. One of the prettiest pieces in that collection is an epigram on two children, whose beauty was very extraordinary, though each of them was deprived of an eye:

'Lumine Acon dextro, capta est Leonilla sinistro;
'Et poterat forma vincere uterque deos.
'Parve puer, lumen quod habes concede sorori;
'Sic tu cæcus Amor, sic erit illa Venus.'

AMAMA (Sixtinus), professor of the Hebrew tongue in the university of Franeker, a man of great learning, was born in Friesland, and had studied under Drusius. He published a criticism upon the translation of the Pentateuch; collated the Dutch translation of the Bible with the original and most accurate translations; and wrote a censure of the Vulgate translation of the historical books of the Old Testament, Job, the Psalms and Canticles. It is impossible to answer the reasons whereby he shows the necessity of consulting the originals.

nals. This he recommended so earnestly, that some synods, being influenced by his reasons, decreed, that none should be admitted into the ministry but such as had a competent knowledge of the Hebrew and Greek text of the Scripture. He died in 1629.

AMANCE, a town in the duchy of Lorrain, upon a rivulet of the same name. E. Long. 6. 10. N. Lat. 48. 45.

AMAND (Mark-Anthony-Gerard, sieur de St.), a French poet, was born at Roan in Normandy in 1594. In the epistle dedicatory to the third part of his works, he tells us, that his father commanded a squadron of ships in the service of Elizabeth queen of England for 22 years, and that he was for three years prisoner in the Black Tower at Constantinople. He mentions also, that two brothers of his had been killed in an engagement against the Turks. His own life was spent in a continual succession of travels, which was of no advantage to his fortune. There are miscellaneous poems of this author, the greatest part of which are of the comic or burlesque, and the amorous kind. Though there are many blemishes in his poems, yet he had the talent of reading them in so agreeable a manner, that every one was charmed with them. In 1650, he published "Stances sur la grossesse de la reine de Pologne et de Seude." There are six stanzas of nine verses each. In 1653, he printed his "Moise sauve, idyle heroique." This poem had at first many admirers: Monf. Chapelain called it a *speaking picture;* but it has since fallen into contempt. Amand wrote also a very devout piece, intitled "Stances à M. Corneille, sur son imitation de Jesus Christ," which was printed at Paris in 1656. Mr Brossette says that he wrote also a poem upon the moon, wherein he paid a compliment to Lewis XIV. upon his skill in swimming, in which he used often to exercise himself when he was young, in the river Seine; but the king could not bear this poem to be read to him, which is said to have affected the author to such a degree, that he did not survive it long. He died in 1661, being 67 years of age. He was admitted a member of the French academy, when it was first founded by cardinal Richlieu, in the year 1633, and Mr Pelisson informs us, that, in 1637, at his own desire, he was excused from the obligation of making a speech in his turn, on condition that he would compile the comic part of the dictionary which the academy had undertaken, and collect the burlesque terms. This was a task well suited to him; for it appears by his writings that he was extremely conversant in these terms, of which he seems to have made a complete collection from the markets and other places where the lower people resort.

AMAND (St.), a city of France, in Bourbonois, on the confines of Berry, seated upon the river Cher. It was built in 1410 on the ruins of Orval. E. Long. 3. 30. N. Lat. 46. 32.

AMAND (St.), a city of the Low Countries, in the earldom of Flanders, seated upon the river Scarpe. It contains about 600 houses, and 3000 or 4000 inhabitants. The abbot of the place is the temporal lord, and disposes of the magistracy. It was given to France by the treaty of Utrecht. E. Long. 2. 35. N. Lat. 50. 27.

AMANICÆ PYLÆ, (Ptolemy); AMANIDES PYLÆ, (Strabo); AMANI PORTÆ, (Pliny): straights or defiles in mount Amanus, through which Darius entered Cilicia; at a greater distance from the sea than the Pylæ Ciliciæ or Syriæ, through which Alexander passed.

AMANTEA, a sea-port town and bishop's see of the kingdom of Naples, situated near the bay of Euphemia in the province of Calabria, in E. Long. 16. 20. N. Lat. 39. 15.

AMANUS, a mountain of Syria, separating it from Cilicia; a branch of mount Taurus, (Cicero, Strabo, Pliny); extending chiefly eastward, from the sea of Cilicia, to the Euphrates: now called *Monte Negro*, or rather *Montagna Neres*, by the inhabitants; that is, the watery mountain, as abounding in springs and rivulets.

AMAPALLA, a city and port-town of North America, in the province of Guatimala, seated on the gulph of the same name, in the Pacific ocean. W. Long. 63. 20. N. Lat. 12. 30.

AMARANTE, an order of knighthood, instituted in Sweden by queen Christina, in 1635, at the close of an annual feast, celebrated in that country, called *Wirtschaft*. This feast was solemnized with entertainments, balls, masquerades, and the like diversions, and continued from evening till the next morning.—That princess, thinking the name too vulgar, changed it into that of the *feast of the gods*, in regard each person here represented some deity as it fell to his lot. The queen assumed the name of *Amarante;* that is, unfading, or immortal. The young nobility, dressed in the habit of nymphs and shepherds, served the gods at the table.—At the end of the feast, the queen threw off her habit, which was covered with diamonds, leaving it to be pulled in pieces by the masques; and, in memory of so gallant a feast, founded a military order, called in Swedish *Ceschilschafft*, into which all that had been present at the feast were admitted, including 16 lords and as many ladies, besides the queen. Their device was the cypher of *Amarante*, composed of two A's, the one erect, the other inverted, and interwoven together; the whole inclosed by a laurel crown, with this motto, *Dolce nella memoria*.

Bulstrode Whitlock, the English ambassador from Cromwell to the court of Sweden, was made a knight of the order of *Amarante*: on which account it seems to be, that we sometimes find him styled *Sir Bulstrode Whitlock*.

AMARANTHOIDES, in botany, the trivial name of a species of illecebrum. See ILLECEBRUM.

AMARANTHUS (of α privative, and μαραινω, *to wither*; because the flower of this plant when cropped does not soon wither), AMARANTH, or FLOWER-GENTLE: A genus of the pentandria order, belonging to the monœcia class of plants; and, in the natural method, ranking under the 54th order, *Miscellaneæ*. The characters are: The *male calyx* is a five or three leav'd perianthium, erect, coloured, and persistent: There is no *corolla*: The *stamina* consist of five or three erect capillary filaments, the length of the calyx: the antheræ are oblong and versatile: The *female* calyx the same as the male, and no corolla: The *pistillum* has an ovate germen; the styli are three, short, and subulated; the stigmata simple and persistent: The *pericarpium* is an

Amaranthus, Amaryllis. an ovate capsule, three-beaked, unilocular, and cut round: The *seed* is one, globular, compressed, and large.

Species. Of this genus Linnæus enumerates 19 species; the most remarkable of which are the following. 1. The tricolor, or three coloured amaranthus. This has been long cultivated in gardens, on account of the beauty of its variegated leaves, which are of three colours, green, yellow, and red; and very elegantly mixed. When the plants are in full vigour, the leaves are large, and closely set from the bottom to the top of the stalks, and the branches from a sort of pyramid; so that there is not a more beautiful plant than this when it is in full lustre. 2. The melanchoticus, bicolor, or two-coloured amaranthus. This greatly resembles the former in its manner of growth; but the leaves have only two colours, which are an obscure purple, and a bright crimson. These are so blended as to set off each other, and, when the plants are vigorous, make a fine appearance. 3. The caudata, with very long hanging cylindrical spikes. This species is a native of America. It hath an upright stem three feet high; the leaves and stalks are of a pale green colour. The spikes of flowers are produced from the wings of the stalks, and also at the extremities of the branches. They are of a bright purple colour, and hang downward, sometimes to the length of two feet and an half, so that many of them touch the ground. 4. The maximus, or tree-like amaranthus, grows with a strong stem, to the height of seven or eight feet. Towards the top it sends forth many horizontal branches, garnished with oblong rough green leaves. At the extremity of every shoot, the cylindrical spikes of flowers are produced. They are of a purple colour, and hang downward like the last; but are seldom half the length, tho' much thicker than the former. 5. The sanguineus, with compound spikes, and oblong oval leaves. This is a native of the Bahama islands. It is an esculent plant, and bears fine flowers. It grows to the height of three feet, with purple stalks and leaves. The spikes are short and cylindrical, of a bright purple at first, but afterwards fade to a darker colour. They are frequently produced from the wings of the stalks; but at the extremity of the stalk arises a large cluster of spikes, which are placed cross-wise, with one upright stalk in the middle. 6. The oleraceus, with obtuse indented leaves. This has no beauty; but it is used by the Indians as a substitute to cabbage.

Culture. The two first of these species being tender, require some art and care to bring them to perfection in Britain, by a succession of hot-bed, with proper waterings, airings, and shadings.

Where people are curious in having these annual plants in great perfection, there should be a glass-case erected, with upright and sloping glasses on every side, with a pit in the bottom for tan, in which the pots should be plunged. If this is raised eight or nine feet to the ridge, and the upright glasses are five feet, there will be room enough to raise these and other annual plants to great perfection; and in such a building, many tender vegetables, which rarely perfect their seeds in a cold climate, may be every year brought forward so as to ripen their seeds.

AMARYLLIS, LILY-ASPHODEL: A genus of the monogynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 9th order, *Spathaceæ*. The characters are: The *calyx* is an oblong obtuse spatha, emarginated, and withering: The *corolla* consists of six petals, lanced: The *stamina* consist of six subulated filaments; the antheræ oblong, incumbent, and ascending: The *pistillum* has a roundish sulcated germen beneath; a filiform stylus, nearly the length of the stamina; the stigma trifid and slender: The *pericarpium* is an ovate trilocular capsule, with three valves: The *seeds* are many.

Amaryllis.

Principal Species. 1. The lutea, or autumnal narcissus. This is usually sold by gardeners, along with colchicums, for autumnal ornaments to gardens. For this purpose it is very proper, as it will keep flowering from the beginning of September to the middle of November, provided the frost is not so severe as to destroy the flowers. Although there is but one flower in each cover, yet there is a succession of flowers from the same root, especially when they are suffered to remain three or four years unremoved. The flowers seldom rise above three or four inches high. They are shaped somewhat like the flowers of the yellow crocus; the green leaves come up at the same time, like the saffron; and, after the flowers are past, the leaves increase all the winter. The roots are bulbous, and shaped like those of the narcissus; so are proper ornaments for such borders as are planted with cyclamens, saffron, autumnal crocus, colchicums, and such low autumnal flowers. 2. The formosissima, or jacobæa lily, produces its flowers two or three times in a year, without being regular to any season. The flowers are of a deep red, the under petals very large, and the whole flower stands nodding on one side of the stalk, making a beautiful appearance. The stems of the flowers are produced from the sides of the bulbs; so that when the flowers produced on one side are decayed, another stalk arises from the other side of the bulb; but there is no more than one flower produced on the same stalk. When the roots are in vigour, flowers will be produced from March to the beginning of September. 3. The sarniensis, or Guernsey lily, is supposed to have come originally from Japan, but has been many years cultivated in the gardens of Guernsey and Jersey; in both which places they seem to thrive as well as if it was their native country, and from these islands their roots are sent annually to the curious in most parts of Europe. The flowers of this species are admired for the richness of their colour, which is commonly red, though they have no scent. They appear towards the end of September; and, if properly managed, will continue a month in beauty. The roots of these plants do not flower again the succeeding year, as is the case with many other bulbs: but if their bulbs contain two buds in their centre, which is often the case, they frequently flower twice in three years; after which the same individual root does not flower again in several years, but only the offsets from it. 4. The regina, or belladonna lily, is a native of Portugal, where it was formerly cultivated in great plenty; but of late it has been supplanted by the jacobæa lily, so that the roots which have been taken from that country for some time past for the belladonna, have generally proved the jacobæa lily. This kind, if properly managed, will sometimes put out two or three stems, growing near three

three feet high, and produce many flowers in each umbel, which make a fine appearance during the mouth of October. 5. The zeylanica, or Ceylon lily, is a native of the West Indies, and usually flowers in June. Sometimes the same root will flower again in autumn, but the flowers are of no long duration. 6. The orientalis, or lily daffodil, with leaves shaped like a tongue. This is a native of the Cape of Good Hope. The bulbs of the root are large and almost round; the leaves long, broad, and rounded at their extremities; these spread two ways on the surface of the ground, and do not come up till after the flower-stem appears, which is generally in November. After the flowers are past, the leaves increase till spring, and in May they begin to decay; so that from the middle of June to October the roots are entirely destitute of leaves.

Culture. The first sort is very hardy, and will thrive in almost any soil or situation; but will succeed best in a fresh light dry soil, and not too near the dripping of trees, or too near walls. It increases very fast by offsets, by which all the other species are also to be propagated. These roots may be transplanted any time from May to the end of July; after which it will be too late to remove them.—The jacobæa ought to be kept in a moderate stove all winter; in which case it will send forth plenty of offsets, that will produce vigorous plants.—The roots of the Guernsey lily are generally brought over in June and July; but the sooner they are taken out of the ground after the leaves decay, the better: for altho' the roots which are taken up when their flower-stems begin to appear, will flower; yet their flowers will not be so large, nor will their roots be near so good after, as those which were removed before they sent forth fresh fibres. When these roots come over, they shoud be planted in pots filled with fresh, light sandy earth, mixed with a little very rotten dung, and placed in a warm situation, observing now and then to refresh the earth with water: but by no means let them have too much wet, which would rot their roots, especially before they come up. About the middle of September, such of the roots as are strong enough to flower will begin to show the bud of their flower-stem: therefore these pots ought to be removed into a situation where they may have the benefit of the sun, and be sheltered from strong winds When the flowers begin open, the pots should be removed under shelter, to prevent injury from too much wet.—After the flowers are decayed, the green leaves will begin to shoot forth in length; and, if sheltered from severe cold, will continue growing all winter: but they must have as much free air as possible in mild weather, and are to be covered only in great rains or frosts. For this purpose, a common hot-bed frame is the most proper shelter for them; the glasses of which may be taken off every day in dry open weather, which will encourage the leaves to grow strong and broad. The roots should be transplanted every fourth or fifth year, toward the end of June or beginning of July; the offsets also should be taken off and planted in pots, where in three years time they will produce flowers. The other species of the amaryllis may easily be raised by taking care to shelter them in a stove from the winter's cold.

AMARYNTHUS (anc. geog.), a hamlet of Eretrias, in the island of Eubœa, about seven stadia distant from its walls. Here Diana was worshipped by an annual solemnity, at which those of Carystus assisted; hence the title of the goddess was *Amarynthis*, and *Amarysia*.

AMASIA (anc. geog.), now *Marpurg*, a city in the landgraviate of Hesse, on the Lahn. According to others, it is Embden in Westphalia.

Amasia, an ancient town of Turkey, in Natolia, remarkable for the birth of Strabo the geographer. It is the residence of a bashaw, and gives its name to the province it stands in, where there are the best wines and the best fruits in Natolia. It is seated near the river Iris or Casalmack; and was anciently the residence of the kings of Cappadocia. E. Long. 36. 10. N. Lat. 39. 33.

Amasia, the name of the northern division of Lesser Asia, lying on the south shore of the Euxine sea in Natolia. It takes its name from Amasia the capital, mentioned in the preceding article.

AMASONIA, in botany: A genus of the angiospermia order, belonging to the Didynamia class of plants; the characters of which are: The *calyx* is a tripartite monophyllous perianthium, bell-shaped and persistent: The *corolla* is monopetalous and tubular; the border quinquefid, expanding, and small: The *stamina* consist of four filaments longer than the corolla; the antheræ oval and incumbent: The *pistillum* has an ovate germen; the stylus the length of the stamina; the stigmata two, acute: There is no *pericarpium:* The *seed* is an ovate unilocular nut, the length of the calyx.

AMATHUS, a very ancient town in the south of Cyprus (Strabo, Ptolemy): so called from Amathus the founder; or, according to others from Amath, a Phœnician town sacred to Venus, with a very ancient temple of Adonis and Venus: and hence Venus is denominated *Amathusia* (Tacitus). According to Ovid, it was a place rich in copper-ore, and where the inhabitants became *Cerastæ*, or horned. Now called *Limisso*.

Amathus (anc. geog.), a town of the tribe of Gad, beyond Jordan; but whether at a greater or less distance from it, is not so easy to determine. Eusebius places it in the Lower Peræa; Reland, in Ramoth-Gilead. Gabinius, proconsul of Syria, established five juridical conventions in Judea; two of which were on the other side Jordan; one at Gadara, the other at Amathus (Josephus).

AMATORII musculii, in anatomy, a term sometimes used for the obliquus superior and obliquus inferior muscles of the eye, as these muscles assist in ogling or drawing the eye sideways.

AMATRICE, a city of the kingdom of Naples, in the farther Abruzzo, upon the confines of the pope's territories, and the marquisate of Ancona.

AMAUROSIS, in medicine, a deprivation of sight, the eye remaining fair, and seemingly unaffected. A perfect amaurosis is when the blindness is total; when there is still a power of distinguishing light from darkness, the disease is called by M. de St Ives an *imperfect amaurosis*. There is a periodical sort which comes on instantaneously, continues for hours, or days, and then disappears. Mr Hay, surgeon at Leeds, mentions several cases of patients afflicted with the amaurosis who were relieved by being electrified.

AMAZONIA, or the country of the American

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AMAZONS, is situate between 50 and 70 degrees of west longitude; and between the equator and 15 degrees of south latitude; being bounded on the south by La Plata, on the west by Peru, on the north by the province of Terra Firma, and on the east by Brazil.

With respect to the Amazons said to have given name to this territory, they have been represented as governed and led to war only by their queen. No men were suffered to live among them; though those of some neighbouring nations were suffered to visit them, at a certain season, for the sake of procreation. The females issuing from this commerce were bred up with care, and instructed in what relates to war and government; as to the males, they were sent away into the country of their fathers. But no such nation is at present to be found, any more than the giants and canibals mentioned by the first adventurers thither.

Amazonia is generally a flat region, abounding in woods, lakes, rivers, bogs, and morasses. The chief river, and one of the largest in the world, is that called the river of Amazons, or the Orellana, which is formed by two large rivers, the one rising in the province of Quito, a little south of the equator, in 73 degrees of west longitude, and the other, named Xauxa, rising in the lake of Bourbon, near the Andes, in ten degrees of south latitude. Those two rivers uniting on the confines of Peru and Amazonia, in three degrees odd minutes of south latitude, assume the name of Amazon; whence running eastward upwards of 200 miles, and afterwards inclining to the north, they fall into the Atlantic ocean by 84 channels, which in the rainy season overflow the adjacent country. Besides the two streams mentioned, a multitude of others, both on the north and south side, contribute to the formation of this extraordinary river. As it runs almost across the broadest part of South America, it is computed to be between four and five thousand miles in length, including all its windings. Its channel from Junta de los Reyos, about 60 degrees from its head, to the river Maranhon, is from one to two leagues broad; it then widens from three to four, and becomes gradually broader as it approaches the ocean. Between the places last mentioned, its depth is from five to ten fathom; but from Maranhon to Rio Negro it increases to 20 fathoms; after which it is sometimes 30, and some times 50 fathoms, or more, till it comes near to the end of its course. It has no sand-banks, nor does the shore shelve so as to render it dangerous for vessels. The manetu and tortoise abound both upon the banks of this and the other rivers; and the fishermen must be upon their guard against the crocodiles, alligators, and water serpents, which also swarm here.

The air, as in the countries under the same parallel, is observed to be nearly as cool under the equator as about the tropics, on account of the rains continuing longer, and the sky in that season being clouded. Besides, an easterly wind sets from the Atlantic up the river so strong, that vessels are carried by it against the stream.

The produce of the country is Indian corn and the cassavi root, of which they make flour and bread; tobacco, cotton, sugar, sarsaparilla, yams, potatoes, and other roots. They have also plenty of venison, fish, and fowl. Among the latter are vast flocks of parrots of all colours, the flesh of which serves for food and the feathers for ornament. All the trees here are evergreens; and fruits, flowers, and herbage, are in perfection all the year round. The principal fruits are cocoa-nuts, ananas or pine-apples, guavas, bananas, and such others as are usually found between the tropics. The forest and timber trees are cedar, Brazil wood, oak, ebony, logwood, iron-wood, so called from its weight and hardness, and several sorts of dyeing wood.

The natives are of the common stature, with good features, a copper complexion, black eyes and hair. It is computed that there are of them about 150 different tribes or nations, and the villages are so numerous as to be within call of one another. Among those the Homagues, a people near the head of the river, are famous for their cotton manufactures; the Jurines, who live between five and ten degrees of latitude, for their joiners works; and the Wrosissares for their earthen ware. The Topinambes, who inhabit a large island in the river, are remarkable for their strength. Some of these nations frequently make war upon each other. Their armour consists of darts, javelins, bows and arrows, and they wear targets of cane, or fish-skin. They make slaves of their prisoners, whom they otherwise use very well. Every tribe is governed by its respective chief or king, the marks of whose dignity are a crown of parrots feathers, a chain of lions teeth or claws hung round his neck, or girt about his waist, and a wooden sword, which he carries in his hand.

Most of those nations, except the Homagues, go naked. The men thrust pieces of cane through their ears and under lips, as well as through the skin of the pudenda. At the gristle of their noses they also hang glass beads, which wag to and fro when they speak. They are such skilful marksmen, that they will shoot fish as they swim; and what they catch they eat without either bread or salt. They worship images, which they always carry with them on their expeditions; but they neither have temples nor any order of priests; and permit both polygamy and concubinage.

The country affords neither gold nor silver mines; only a small quantity of the former is found in the rivulets which fall into the Amazon near its sources in Peru. While the Spaniards imagined that it contained those metals, they made great efforts from Peru to reduce this territory to subjection; till being at length undeceived, they abandoned the design.

AMAZONS, in antiquity, a nation of female warriors, who founded an empire in Asia minor, upon the river Thermodoon, along the coasts of the Black Sea. They are said to have formed a state out of which men were excluded. What commerce they had with that sex, was only with strangers; they killed all their male children; and they cut off the right breast of their females, to make them more fit for the combat. From which last circumstance it is, that they are supposed to take their name, viz. from the primitive α, and μαζος, *mamma*, "breast." But Dr Bryant, in his Analysis of ancient mythology, explodes this account as fabulous; and observes, that they were in general Cuthite colonies from Egypt and Syria, who formed settlements in different countries, and that they derived their name from *zon*, the "sun," which was the national object of worship. Vol. iii. p. 463.—It has indeed

Amazons. deed been controverted even among ancient writers, whether ever there really were ſuch a nation as that of the Amazons. Strabo, Palæphatus, and others, deny it. On the contrary, Herodotus, Pauſanius, Diodorus Siculus, Trogus Pompeius, Juſtin, Pliny, Mela, Plutarch, &c. expreſsly aſſert it.

M. Petit, a French phyſician, publiſhed a Latin diſſertation in 1685, to prove that there was really a nation of Amazons; it contains abundance of curious inquiries, relating to their habit, their arms, the cities built by them, &c. Others of the moderns alſo maintain, that their exiſtence is ſufficiently proved by the teſtimony of ſuch of the hiſtorians of antiquity as are moſt worthy of credit; by the monuments which many of them have mentioned; and by medals, ſome of which are ſtill remaining; and that there is not the leaſt room to believe that what is ſaid of them is fabulous.

The Amazons are mentioned by the moſt ancient of the Greek writers. In the third book of the Iliad, Homer repreſents Priam ſpeaking of himſelf as having been preſent, in the earlier part of his life, in a battle with the Amazons: and ſome of them afterwards came to the aſſiſtance of that prince during the ſiege of Troy.

The Amazons are particularly mentioned by Herodotus. That hiſtorian informs us, that the Grecians fought a battle with the Amazons on the river Thermodoon, and defeated them. After their victory, they carried off all the Amazons they could take alive, in three ſhips. But whilſt they were out at ſea, theſe Amazons conſpired againſt the men, and killed them all. Having, however, no knowledge of navigation, nor any ſkill in the uſe of the rudder, ſails, or oars, they were driven by wind and tide till they arrived at the precipices of the lake Mæotis, in the territories of the Scythians. Here the Amazons went aſhore, and marching into the country, ſeized and mounted the firſt horſes they met with, and began to plunder the inhabitants. The Scythians at firſt conceived them to be men; but after they had had ſkirmiſhes with them, and taken ſome priſoners, they diſcovered them to be women. They were then unwilling to carry on hoſtilities againſt them; and by degrees a number of the young Scythians formed connections with them, and were deſirous that theſe gentle dames ſhould live with them as wives, and be incorporated with the reſt of the Scythians. The Amazons agreed to continue their connection with the Scythian huſbands, but refuſed to aſſociate with the reſt of the inhabitants of the country, and eſpecially with the women of it. They afterwards prevailed upon their huſbands to retire to Sarmatia, where they ſettled. "Hence," ſays Herodotus, "the wives of the Sarmatians ſtill continue their ancient way of living. They hunt on horſeback in the company of their huſbands, and ſometimes alone. They march with their armies, and wear the ſame dreſs with the men. The Sarmatians uſe the Scythian language, but corrupted from the beginning, becauſe the Amazons never learned to ſpeak correctly. Their marriages are attended with this circumſtance: no virgin is permitted to marry till ſhe has killed an enemy in the field; ſo that ſome always grow old before they can qualify themſelves as the law requires."

Diodorus Siculus ſays, "There was formerly a nation who dwelt near the river Thermodoon, which was ſubjected to the government of women, and in which the women, like men, managed all the military affairs. Among theſe female warriors, it is ſaid, was one who excelled the reſt in ſtrength and valour. She aſſembled together an army of women, whom ſhe trained up in military diſcipline, and ſubdued ſome of the neighbouring nations. Afterwards, having by her valour increaſed their fame, ſhe led her army againſt the reſt; and being ſucceſsful, ſhe was ſo puffed up, that ſhe ſtyled herſelf the daughter of Mars, and ordered the men to ſpin wool, and do the work of the women within doors. She alſo made laws, by which the women were enjoined to go to the wars, and the men to be kept at home in a ſervile ſtate, and employed in the meaneſt offices. They alſo debilitated the arms and thighs of thoſe male children who were born to them, that they might be thereby rendered unfit for war. They feared the right breaſts of their girls, that they might be no hindrance to them in fighting: from whence they derived the name of Amazons. Their queen, having become extremely eminent for ſkill and knowledge in military affairs, at length built a large city at the mouth of the river Thermodoon, and adorned it with a magnificent palace. In her enterprizes ſhe exactly adhered to military diſcipline and good order; and ſhe added to her empire all the adjoining nations, even to the river Tanais. Having performed theſe exploits, ſhe at laſt ended her days like a hero, falling in a battle, in which ſhe had fought courageouſly. She was ſucceeded in the kingdom by her daughter, who imitated the valour of her mother, and in ſome exploits excelled her. She cauſed the girls from their very infancy to be exerciſed in hunting, and to be daily trained up in military exerciſes. She inſtituted ſolemn feſtivals and ſacrifices to Mars and Diana, which were named Tauropoli. She afterwards carried her arms beyond the river Tanais, and ſubdued all the people of thoſe regions even unto Thrace. Returning then with a great quantity of ſpoils into her own kingdom, ſhe cauſed magnificent temples to be erected to the deities before mentioned; and ſhe gained the love of her ſubjects by her mild and gentle government. She afterwards undertook an expedition againſt thoſe who were on the other ſide of the river, and ſubjected to her dominion a great part of Aſia, extending her arms as far as Syria."

Diodorus alſo mentions another race of Amazons who dwelt in Africa; and whom he ſpeaks of as being of greater antiquity than theſe who lived near the river Thermodoon. "In the weſtern parts of Lybia," ſays he, "upon the borders of thoſe tracts that are habitable, there was anciently a nation under the government of women, and whoſe manners and mode of living were altogether different from ours. It was the cuſtom for theſe women to manage all military affairs; and for a certain time, during which they preſerved their virginity, they went out as ſoldiers in the field. After ſome years employed in this manner, when the time appointed for this purpoſe was expired, they aſſociated themſelves with men, in order to obtain children. But the magiſtracy, and all public offices, they kept entirely in their own hands. The men, as the women are with us, were employed in houſehold affairs, ſubmitting themſelves wholly to the authority of their wives. They were not permitted to take any part in military

Amazons.

military affairs, or to have any command, or any public authority, which might have a tendency to encourage them to cast off the yoke of their wives. As soon as any child was born, it was delivered to the father, to be fed with milk or such other food as was suitable to its age. If females were born, they seared their breasts, that they might not be burdensome to them when they grew up; for they considered them as great hindrances in fighting."

Justinian represents the Amazonian republic to have taken its rise in Scythia. The Scythians had a great part of Asia under their dominion upwards of 400 years, till they were conquered by Ninus, the founder of the Assyrian empire. After his death, which happened about 1150 years before the Christian æra, and that of Semiramis and their son Ninias, Ilinus and Scolopites, princes of the royal blood of Scythia, were driven from their country by other princes, who like them aspired to the crown. They departed with their wives, children, and friends; and being followed by a great number of young people of both sexes, they passed into Asiatic Sarmatia, beyond mount Camassus, where they formed an establishment, supplying themselves with the riches they wanted, by making excursions into the countries bordering on the Euxine Sea. The people of those countries, exasperated by the incursions of their new neighbours, united, surprised, and massacred the men.

The women then resolving to revenge their death, and at the same time to provide for their own security, resolved to form a new kind of government, to choose a queen, enact laws, and maintain themselves, without men, even against the men themselves. This design was not so very surprising as at first sight appears: for the greatest number of the girls among the Scythians had been inured to the same exercises as the boys; to draw the bow, to throw the javelin, to manage other arms; to riding, hunting, and even the painful labours that seem reserved for men; and many of them, as among the Sarmatians, accompanied the men in war. Hence they had no sooner formed their resolution, than they prepared to execute it, and exercised themselves in all military operations. They soon secured the peaceable possession of the country; and not content with showing their neighbours that all their efforts to drive them thence or subdue them were ineffectual, they made war upon them, and extended their own frontiers. They had hitherto made use of the instructions and assistance of a few men that remained in the country; but finding at length that they could stand their ground, and aggrandize themselves, without them, they killed all those whom flight or chance had saved from the fury of the Sarmatians, and forever renounced marriage, which they now considered as an insupportable slavery. But as they could only secure the duration of their new kingdom by propagation, they made a law to go every year to the frontiers, to invite the men to come to them; to deliver themselves up to their embraces, without choice on their part, or the least attachment; and to leave them as soon as they were pregnant. All those whom age rendered fit for propagation, and were willing to serve the state by breeding girls, did not go at the same time in search of men: for in order to obtain a right to promote the multiplication of the species, they must first have contributed to its destruction; nor was any thought worthy of giving birth to children till she had killed three men.

If from this commerce they brought forth girls, they educated them; but with respect to the boys, if we may believe Justin, they strangled them at the moment of their birth: according to Diodorus Siculus, they twisted their legs and arms, so as to render them unfit for military exercises; but Quintus Curtius, Philostratus, and Jordarus, say that the less savage sent them to their fathers. It is probable, that at first, when their fury against the men was carried to the greatest height, they killed the boys: that when this fury abated, and most of the mothers were filled with horror at depriving the little creatures of the lives they had just received from them, they fulfilled the first duties of a mother; but, to prevent their causing a revolution in the state, maimed them in such a manner as to render them incapable of war, and employed them in the mean offices which these warlike women thought beneath them: in short, that, when their conquests had confirmed their power, their ferocity subsiding, they entered into political engagements with their neighbours; and the number of the males they had preserved becoming burthensome, they, at the desire of those who rendered them pregnant, sent them the boys, and continued still to keep the girls.

As soon as the age of the girls permitted, they took away the right breast, that they might draw the bow with the greater force. The common opinion is, that they burnt that breast, by applying to it, at eight years of age, a hot brazen instrument, which insensibly dried up the fibres and glands: some think that they did not make use of so much ceremony, but that when the part was formed they got rid of it by amputation: some, again, with much greater probability, assert, that they employed no violent measures; but, by a continual compression of that part from infancy, prevented its growth, at least so far as to hinder its ever being incommodious in war.

Plutarch, treating of the Amazons in his life of Theseus, considers the accounts which had been preserved concerning them as partly fabulous and partly true. He gives some account of a battle which had been fought between the Athenians and the Amazons at Athens; and he relates some particulars of this battle, which had been recorded by an ancient writer named Clidemus. He says, "That the left wing of the Amazons moved towards the place which is yet called Amazonium, and the right to a place called Pryx, near Chrysa; upon which the Athenians, issuing from behind the temple of the muses, fell upon them; and that this is true, the graves of those that were slain, to be seen in the streets that lead to the gate Piraica, by the temple of the hero Chalcodüe, are a sufficient proof. And here it was that the Athenians were routed, and shamefully turned their backs to women, as far as to the temple of the Furies. But fresh supplies coming in from Palladium, Ardettus, and Lyceum, charged their right wing, and beat them back into their very tents; in which action a great number of the Amazons were slain." In another place he says, "It appears that the passage of the Amazons through Thessaly was not without opposition; for there are yet to be seen many of their sepulchres near Scotusæa and Cynocephalæ." And in his life of Pompey, speaking of the

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the Amazons, Plutarch ſays, "They inhabit thoſe parts of mount Caucaſus that look towards the Hyrcanian ſea (not bordering upon the Albanians, for the territories of the Getæ and the Leges lie betwixt): and with theſe people do they yearly, for two months only, accompany and cohabit, bed and board, near the river Thermodoon. After that they retire to their own habitations, and live alone all the reſt of the year."

Quintus Curtius ſays, "The nation of the Amazons is ſituated upon the borders of Hyrcania, inhabiting the plains of Thermiſcyra, near the river Thermodoon. Their queen was named Thaleſtris; and ſhe had under her ſubjection all the country that lies between mount Caucaſus and the river Phaſis. This queen came out of her dominions, in conſequence of an ardent deſire ſhe had conceived to ſee Alexander; and being advanced near the place where he was, ſhe previouſly ſent meſſengers to acquaint him, that the queen was come to have the ſatisfaction of ſeeing and converſing with him. Having obtained permiſſion to viſit him, ſhe advanced with 300 of her Amazons, leaving the reſt of her troops behind. As ſoon as ſhe came within ſight of the king, ſhe leaped from her horſe, holding two javelins in her right hand. The apparel of the Amazons does not cover all the body; for their left ſide is naked down to the ſtomach, nor does the ſkirts of their garments, which they tie up in a knot, reach below their knees. They preſerve their left breaſt entire, that they may be able to ſuckle their female offspring; and they cut off and ſear their right, that they may draw their bows, and caſt their darts, with the greater eaſe. Thaleſtris looked at the king with an undaunted countenance, and narrowly examined his perſon; which did not, according to her ideas, come up to the fame of his great exploits: For the barbarians have a great veneration for a majeſtic perſon, eſteeming thoſe only to be capable of performing great actions, on whom nature has conferred a dignified appearance. The king having aſked her whether ſhe had any thing to deſire of him, ſhe replied, without ſcruple or heſitation, that ſhe was come with a view to have children by him, ſhe being worthy to bring him heirs to his dominions. Their offspring, if of the female ſex, ſhe would retain herſelf; and if of the male ſex, it ſhould be delivered to Alexander. He then aſked her, whether ſhe would accompany him in his wars? But this ſhe declined, alleging, That ſhe had left nobody to take care of her kingdom. She continued to ſolicit Alexander, that he would not ſend her back without conforming to her wiſhes; but it was not till after a delay of 13 days that he complied. She then returned to her own kingdom.

Juſtin alſo repeatedly mentions this viſit of Thaleſtris to Alexander; and in one place he ſays, that ſhe made a march of 25 days, in order to obtain this meeting with him. The interview between Alexander and Thaleſtris is likewiſe mentioned by Diodorus Siculus. The learned Goropius, as he is quoted by Dr Petit, laments, in very pathetic terms, the hard fate of Thaleſtris, who was obliged to travel ſo many miles, and to encounter many hardſhips, in order to procure this interview with the Macedonian prince, and, from the circumſtances, is led to conſider the whole account as incredible. But Dr Petit, with equal erudition, with equal eloquence, and with ſuperior force of reaſoning, at length determines, that her journey was not founded upon irrational principles, and that full credit is due to thoſe grave and venerable hiſtorians by whom this tranſaction has been recorded.

The Amazons are repreſented as being armed with bows and arrows, with javelins, and alſo with an axe of a particular conſtruction, which was denominated the axe of the Amazons. According to the elder Pliny, this axe was invented by Penthiſilea, one of their queens. On many ancient medals are repreſentations of the Amazons, armed with theſe axes. They are alſo ſaid to have had bucklers in the ſhape of a half-moon.

The Amazons are mentioned by many other ancient authors beſides thoſe which have been enumerated; and if any credit be due to the accounts concerning them, they ſubſiſted through ſeveral ages. They are repreſented as having rendered themſelves extremely formidable; as having founded cities, enlarged the boundaries of their dominions, and conquered ſeveral other nations.

That at any period there ſhould have been women, who, without the aſſiſtance of men, built cities and governed them, raiſed armies and commanded them, adminiſtered public affairs, and extended their dominion by arms, is undoubtedly ſo contrary to all that we have ſeen and known of human affairs, as to appear in a very great degree incredible; but that women may have exiſted ſufficiently robuſt and ſufficiently courageous to have engaged in warlike enterpriſes, and even to have been ſucceſsful in them, is certainly not impoſſible, however contrary to the uſual courſe of things. In ſupport of this ſide of the queſtion, it may be urged, that women who have been early trained to warlike exerciſes, to hunting, and to an hard and laborious mode of living, may be rendered more ſtrong, and capable of more vigorous exertions, than men who have led indolent, delicate, luxurious lives, and who have ſeldom been expoſed even to the inclemencies of the weather. The limbs of women, as well as of men, are ſtrengthened and rendered more robuſt by frequent and laborious exerciſe. A nation of women, therefore, brought up and diſciplined as the ancient Amazons are repreſented to have been, would be ſuperior to an equal number of effeminate men; though they might be much inferior to an equal number of hardy men trained up and diſciplined in the ſame manner.

That much of what is ſaid of the Amazons is fabulous, there can be no reaſonable doubt; but it does not therefore follow, that the whole is without foundation. The ancient medals and monuments on which they are repreſented are very numerous, as are alſo the teſtimonies of ancient writers. It ſeems not rational to ſuppoſe that all this originated in fiction, though it may be much blended with it. The Abbé Guyon ſpeaks of the hiſtory of the Amazons as having been regarded by many perſons as fabulous, "rather from prejudice than from any real and ſolid examination;" and it muſt be acknowledged, that the arguments in favour of their exiſtence, from ancient hiſtory, and from ancient monuments, are extremely powerful. The fact ſeems to be, that truth and fiction have been blended in the narrations concerning theſe ancient heroines.

Inſtances of heroiſm in women have occaſionally occurred in modern times, ſomewhat reſembling that of the ancient Amazons. The times and the manners of chivalry in particular, by bringing great enterpriſes, bold

Amazons. bold adventures, and extravagant heroism, into fashion, inspired the women with the same taste. The women, in consequence of the prevailing passion, were now seen in the middle of camps and of armies. They quitted the soft and tender inclinations, and the delicate offices of their own sex, for the toils and the toilsome occupation of ours. During the crusades, animated by the double enthusiasm of religion and of valour, they often performed the most romantic exploits; obtained indulgences on the field of battle, and died with arms in their hands, by the side of their lovers or of their husbands.

In Europe, the women attacked and defended fortifications; princesses commanded their armies, and obtained victories. Such was the celebrated Joan de Montfort, disputing for her duchy of Bretagne, and fighting in person. Such was that still more celebrated Margaret of Anjou, active and intrepid general and soldier, whose genius supported a long time a feeble husband; which taught him to conquer; which replaced him upon the throne; which twice relieved him from prison; and, oppressed by fortune and by rebels, which did not bend till after she had decided in person twelve battles.

The warlike spirit among the women, consistent with ages of barbarism, when every thing is impetuous because nothing is fixed, and when all excess is the excess of force, continued in Europe upwards of 400 years, showing itself from time to time, and always in the middle of convulsions or on the eve of great revolutions. But there were æras and countries in which that spirit appeared with particular lustre. Such were the displays it made in the 15th and 16th centuries in Hungary, and in the islands of the Archipelago and the Mediterranean when they were invaded by the Turks.

Among the striking instances of Amazonian conduct in modern ladies, may be mentioned that of Jane of Belleville, widow of Mons. de Clisson, who was beheaded at Paris in the year 1343, on a suspicion of carrying on a correspondence with England and the Count de Montfort. This lady, filled with grief for the death of her late husband, and exasperated at the ill treatment which she considered him as having received, sent off "her son secretly to London; and when her apprehensions were removed with respect to him, she sold her jewels, fitted out three ships, and put to sea, to revenge the death of her husband upon all the French with whom she should meet. This new corsair made several descents upon Normandy, where she stormed castles; and the inhabitants of that province were spectators more than once, whilst their villages were all in a blaze, of one of the finest women in Europe, with a sword in one hand and a torch in the other, urging the carnage, and eyeing with pleasure all the horrors of war."

We read in Mezeray, under the article of the Croisade, preached by St Bernard in the year 1147, "That many women did not content themselves with taking the cross, but that they also took up arms to defend it, and composed squadrons of females, which rendered credible all that has been said of the prowess of the Amazons."

In the year 1590, the League party obtained some troops from the king of Spain. Upon the news of their being disembarked, Barri de St Aunez, Henry IV.'s governor at Leucate, set out to communicate a scheme to the Duke de Montmorenci, commander in that province. He was taken on his way by some of the troops of the League, who were also upon their march with the Spaniards towards Leucate. They were persuaded, that by thus having the governor in their hands the gates of that place would be immediately opened to them, or at least would not hold out long. But Constantia de Cecelli, his wife, after having assembled the garrison, put herself so resolutely at their head, pike in hand, that she inspired the weakest with courage; and the besiegers were repulsed wherever they presented themselves. Shame and their great loss having rendered them desperate, they sent a message to this courageous woman, acquainting her, that if she continued to defend herself they would hang her husband. She replied with tears in her eyes, "I have riches in abundance: I have offered them, and I do still offer them, for his ransom; but I would not ignominiously purchase a life which he would reproach me with, and which he would be ashamed to enjoy. I will not dishonour him by treason against my king and country." The besiegers having made a fresh attack without success, put her husband to death, and raised the siege. Henry IV. afterwards sent to this lady the brevet of governess of Leucate, with the reversion for her son.

The famous Maid of Orleans, also is an example known to every reader.

The Abbé Arnaud, in his Memoirs, speaks of a Countess of St Balmont, who used to take the field with her husband and fight by his side. She sent several Spanish prisoners of her taking to Marshal Fenquiers; and what is not a little extraordinary, this Amazon at home was all affability and sweetness, and gave herself up to reading and acts of piety.

Dr Johnson seems to have given some credit to the accounts which have been transmitted down to us concerning the ancient Amazons; and he has endavoured to show, that we ought not hastily to reject ancient historical narrations because they contain facts repugnant to modern manners, and exhibit scenes to which nothing now occuring bears a resemblance. "Of what we know not (says he), we can only judge by what we know. Every novelty appears more wonderful as it is more remote from any thing with which experience or testimony have hitherto acquainted us: and if it passes farther, beyond the notions that we have been accustomed to form, it becomes at last incredible. We seldom consider, that human knowledge is very narrow; that national manners are formed by chance; that uncommon conjunctures of causes produce rare effects; or that what is impossible at one time or place may yet happen in another. It is always easier to deny than to enquire. To refuse credit confers for a moment an appearance of superiority which every little mind is tempted to assume, when it may be gained so cheaply as by withdrawing attention from evidence, and declining the fatigue of comparing probabilities. Many relations of travellers have been slighted as fabulous, till more frequent voyages have confirmed their veracity; and it may reasonably be imagined, that many ancient historians are unjustly suspected of falsehood, because our own times afford nothing that resembles what they tell. Few narratives will either to men or women appear more incredible than the histories of the Amazons; of female nations, of whose constitution

ſtitution it was the eſſential and fundamental law, to exclude men from all participation either of public affairs or domeſtic buſineſs; where female armies marched under female captains, female farmers gathered the harveſt, female partners danced together, and female wits diverted one another. Yet ſeveral ages of antiquity have tranſmitted accounts of the Amazons of Caucaſus; and of the Amazons of America, who have given their name to the greateſt river in the world. Condamine lately found ſuch memorials as can be expected among erratic and unlettered nations, where events are recorded only by tradition, and new ſwarms ſettling in the country from time to time confuſe and efface all traces of former times."

No author has taken ſo much pains upon this ſubject as Dr Petit. But in the courſe of his work, he has given it as his opinion, that there is great difficulty in governing the women even at preſent, though they are unarmed and unpractiſed in the art of war. After all his elaborate inquiries and diſcuſſions, therefore, this learned writer might probably think, that it is not an evil of the firſt magnitude that the race of Amazons now ceaſes to exiſt.

Rouſſeau ſays, "The empire of the woman is an empire of ſoftneſs, of addreſs, of complacency. Her commands are careſſes, her menaces are tears." But the empire of the Amazons was certainly an empire of a very different kind. Upon the whole, we may conclude with Dr Johnſon: "The character of the ancient Amazons was rather terrible than lovely. The hand could not be very delicate that was only employed in drawing the bow and brandiſhing the battle-axe. Their power was maintained by cruelty, their courage was deformed by ferocity; and their example only ſhows, that men and women live beſt together."

Amazons (the river of), in America. See Amazonia.

Amazonian Habit, in antiquity, denotes a dreſs formed in imitation of the Amazons. Marcia, the famous concubine of the emperor Commodus, had the appellation of *Amazonian*, becauſe ſhe charmed him moſt in a habit of this kind. Hence alſo that prince himſelf engaged in combat in the amphitheatre in an Amazonian habit; and of all titles the *Amazonius* was one of thoſe he moſt delighted in.—In honour either of the gallant or his miſtreſs, the month of December was alſo denominated *Amazonius*—Some alſo apply *Amazonian habit* to the hunting-dreſs worn by many ladies among us.

AMBA, an Abyſſinian or Ethiopic word, ſignifying a *rock*. The Abyſſinians give names to each of their rocks, as *Amba-Dorho*, the rock of a hen, &c. Some of theſe rocks are ſaid to have the name of *Aorni*; and are of ſuch a ſtupendous height, that the Alps and Pyrenees are but low hills in compariſon of them. Amongſt the mountains, and even frequently in the plains, of this country, ariſe ſteep and craggy rocks of various forms, ſome reſembling towers, others pyramids, &c. ſo perpendicular and ſmooth on the ſides, that they ſeem to be works of art; inſomuch, that men, cattle, &c. are craned up by the help of ladders and ropes: and yet the tops of theſe rocks are covered with woods, meadows, fountains, fiſhponds, &c. which very copiouſly ſupply the animals ſeated thereon with all the conveniences of life. The moſt remarkable of theſe rocks is called *Amba-Geſhen*. It is prodigiouſly ſteep, in the form of a caſtle built of free ſtone, and almoſt impregnable. Its ſummit is about half a Portugueſe league in breadth, and the circumference at the bottom about half a day's journey. The aſcent at firſt is eaſy; but grows afterwards ſo ſteep, that the Abyſſine oxen, which will otherwiſe clamber like goats, muſt be craned up, and let down with ropes. Here the princes of the blood were formerly confined, in low cottages amongſt ſhrubs and wild cedars, with an allowance barely ſufficient to keep them alive. There is, according to Kircher, in this country, a rock ſo curiouſly hollowed by nature, that at a diſtance it reſembles a looking-glaſs; and oppoſite to this another, on the top of which nothing can be ſo ſoftly whiſpered, but it may be heard a great way off. Between many of theſe rocks and mountains are vaſt abyſſes, which appear very dreadful to the eye.

AMBACHT, in topography, denotes a kind of juriſdiction or territory, the poſſeſſor whereof has the adminiſtration of juſtice both in *alto* and *baſſo*; or of what is called in the Scots law *a power of pit and gallows*, i. e. a power of drowning and hanging.—In ſome ancient writers, ambacht is particularly uſed for the juriſdiction, government, or chief magiſtracy of a city. The word is very ancient, though uſed originally in a ſenſe ſomewhat different. Ennius calls a mercenary, or ſlave hired for money *ambactus*; and Cæſar gives the ſame appellation to a kind of dependents among the Gauls, who, without being ſlaves, were attached to the ſervice of great lords.

AMBAGES. See Circumlocution.

AMBARVALIA, in antiquity, a ceremony among the Romans, when, in order to procure from the gods an happy harveſt, they conducted the victims thrice round the corn fields in proceſſion, before ſacrificing them.—*Ambarvalia* were either of a private or public nature: the private were performed by the maſter of a family; and the public by the prieſts who officiated at the ſolemnity, called *fratres ovales*. The prayer preferred on this occaſion, the formula of which we have in Cato *de Re Ruſtica*, cap. cxlii. was called *carmen ambervale*. At theſe feaſts they ſacrificed to Ceres a ſow, a ſheep, and a bull or heifer, whence they took the name of *ſuovetaurilia*. The method of celebrating them was, to lead a victim round the fields, while the peaſants accompanied it, and one of their number, crowned with oak, hymned forth the praiſes of Ceres, in verſes compoſed on purpoſe. This feſtival was celebrated twice a-year; at the end of January, according to ſome, or in April, according to others; and for the ſecond time, in the month of July.

AMBASSADOR, or Embassador, a public miniſter ſent ſent from one ſovereign prince, as a repreſentative of his perſon to another.

Ambaſſadors are either ordinary or extraordinary. Ambaſſador *in ordinary*, is he who conſtantly reſides in the court of another prince, to maintain a good underſtanding, and look to the intereſt of his maſter. Till about two hundred hears ago, ambaſſadors in ordinary were not heard of: all, till then, were ambaſſadors *extraordinary*; that is, ſuch as are ſent on ſome extraordinary occaſion, and who retire as ſoon as the affair is diſpatched.

By the law of nations, none under the quality of a ſovereign prince can ſend or receive an ambaſſador. At Athens, ambaſſadors mounted the pulpit of the public orators, and there opened their commission, acquainting the people with their errand. At Rome, they were introduced to the senate, and delivered their commissions to the fathers.

Ambassadors should never attend any public solemnities, as marriages, funerals, &c. unless their masters have some interest therein: nor must they go into mourning on any occasions of their own, because they represent the person of their prince. By the civil law, the moveable goods of an ambassador, which are accounted an accession to his person, cannot be seized on, neither as a pledge, nor for payment of a debt, nor by order or execution of judgment, nor by the king's or state's leave where he resides, as some conceive; for all actions ought to be far from an ambassador, as well that which toucheth his necessaries, as his person: if, therefore, he hath contracted any debt, he is to be called upon kindly; and if he refuses, then letters of request are to go to his master. Nor can any of the ambassador's domestic servants that are registered in the secretaries of state's office be arrested in person or goods; if they are, the process shall be void, and the parties suing out and executing it shall suffer and be liable to such penalties and corporal punishment as the lord chancellor or either of the chief justices shall think fit to inflict. Yet ambassadors cannot be defended when they commit any thing against that state, or the person of the prince, with whom they reside; and if they are guilty of treason, felony, &c. or any other crime against the law of nations, they lose the privilege of an ambassador, and may be subject to punishment as private aliens.

AMBE, in *surgery*, the name of an instrument for reducing dislocated bones. In *anatomy*, a term for the superficial jutting out of a bone.

AMBER (*Succinum*), in natural history, a solid, hard, semipellucid, bituminous substance of a particular nature, of use in medicine and in several of the arts. It has been called *ambra* by the Arabians, and *electrum* by the Greeks.

Amber has been of great repute in the world from the earliest times. Many years before Christ it was in esteem as a medicine; and Plato, Aristotle, Herodotus, Æschylus, and others, have commended its virtues. In the times of the Romans it became in high esteem as a gem; and in the luxurious reign of Nero, immense quantities of it were brought to Rome, and used for ornamenting works of various kinds.

The most remarkable property of this substance is, that, when rubbed, it draws or attracts other bodies to it: and this, it is observed, it does, even to those substances which the ancients thought it had an antipathy to; as oily bodies, drops of water, human sweat, &c. Add, that by the friction is is brought to yield light pretty copiously in the dark; whence it is reckoned among the native phosphori.

The property which amber possesses of attracting light bodies, was very anciently observed. Thales of Miletus, 600 years before Christ, concluded from hence that it was animated. But the first person who expressly mentions this substance, is Theophrastus, about the year 300 before Christ. The attractive property of amber is likewise occasionally taken notice of by Pliny, and other later naturalists, particularly by Gassendus, Kenelm Digby, and Sir Thomas Brown; but it was generally apprehended that this quality was peculiar to amber and jet, and perhaps agate, till Gilbert published his treatise *De Magnete*, in the year 1600. From ηλεκτρον, the Greek name for amber, is derived the term *Electricity*, which is now very extensively applied not only to the power of attracting light bodies, inherent in amber, but to other similar powers, and their various effects, in whatever bodies they reside, or to whatever bodies they may be communicated.

Amber assumes all figures in the ground; that of a pear, an almond, a pea, &c. In amber there have been said to be letters found very well formed; and even Hebrew and Arabic characters.—Within some pieces, leaves, insects, &c. have likewise been found included; which seems to indicate, either that the amber was originally in a fluid state, or that having been exposed to the sun, it was once softened, and rendered susceptible of the leaves, insects, &c. which came in its way. The latter of these suppositions seems the more agreeable to the phenomenon, because those insects, &c. are never found in the centre of the pieces of amber, but always near the surface. It is observed by the inhabitants of those places where amber is produced, that all animals, whether terrestrial, aerial, or aquatic, are extremely fond of it, and that pieces of it are frequently found in their excrements. The bodies of insects, found buried in amber, are viewed with admiration by all the world; but of the most remarkable of these, many are to be suspected as counterfeit, the great price at which beautiful specimens of this kind sell, having tempted ingenious cheats to introduce animal bodies in such artful manners into seemingly whole pieces of amber, that it is not easy to detect the fraud.

Of those insects which have been originally inclosed in amber, some are plainly seen to have struggled hard for their liberty, and even to have left their limbs behind them in the attempt; it being no unusual thing to see, in a mass of amber that contains a stout beetle, the animal wanting one, or perhaps two of its legs; and those legs left in different places, nearer that part of the mass from which it has travelled. This also may account for the common accident of finding legs, or wings of flies, without the rest of their bodies, in pieces of amber; the insects having, when entangled in the yet soft and viscid matter, escaped, at the expence of leaving those limbs behind them. Drops of clear water are sometimes also preserved in amber. These have doubtless been received into it while soft, and preserved by its hardening round them. Beautiful leaves of a pinnated structure, resembling some of the ferns, or maidenhairs, have been found in some pieces; but these are rare, and specimens of great value. Mineral substances are also found at times lodged in masses of amber. Some of the pompous collections of the German princes boast of specimens of native gold and silver in masses of amber; but as there are many substances of the marcasite, and other kinds, that have all the glittering appearance of gold and silver, it is not to be too hastily concluded that these metals are really lodged in these beds of amber. Iron is found in various shapes immersed in amber; and as it is often seen eroded, and sometimes in the state of vitriol, it is not impossible but that copper, and the other metals, may be also sometimes immersed in it in the same state: hence the bluish and greenish colours, frequently found in the recent pieces of amber, may be owing, like the particles

Amber. particles of the gem colours, to those metals; but as the gems, by their dense texture, always retain their colours, this lighter and more lax bitumen usually loses what it gets of this kind, by keeping some time. Small pebbles, grains of sand, and fragments of other stones, are not unfrequently also found immersed in amber.

Naturalists have been greatly divided as to the origin of this substance, and what class of bodies it belongs to; some referring it to the vegetable, others to the mineral, and some even to the animal kingdom. Pliny describes it as "a resinous juice, oozing from "aged pines and firs (others say from poplars, whereof there are whole forests on the coasts of Sweden), "and discharged thence into the sea, where, undergoing some alteration, it is thrown, in this form, "upon the shores of Prussia, which lie very low: he "adds, that it was hence the ancients gave it the denomination *succinum*; from *succus*, juice."

Some suppose amber a compound substance. Prussia, say they, and the other countries which produce amber, are moistened with a bituminous juice, which mixing with the vitriolic salts abounding in those places, the points of those salts fix its fluidity, whence it congeals; and the result of that congelation makes what we call amber; which is more or less pure, transparent, and firm, as those parts of salt and bitumen are more or less pure, and are mixed in this or that proportion.

Mr Brydone, in his tour to Sicily and Malta, says, that the river Gearetta, formerly celebrated by the poets under the name of Simetus, throws up near its mouth great quantities of amber. He mentions also a kind of artificial amber, not uncommon there, made, as he was told, from copal, but very different from the natural.

According to Hartman, amber is formed of a bitumen, mixed with vitriol and other salts. But though this were allowed him in regard to the fossile amber, many dispute whether the sea-amber be so produced. It is, however, apparent, that all amber is of the same origin, and probably that which is found in the sea has been washed thither out of the cliffs; though Hartman thinks it very possible, that some of it may be formed in the earth under the sea, and be washed up thence. The sea-amber is usually finer to the eye than the fossile; but the reason is, that it is divested of that coarse coat with which the other is covered while in the earth.

Upon the whole, it seems generally agreed upon, that amber is a true bitumen of fossile origin.—In a late volume of the *Journal de Physique*, however, we find it asserted by Dr Girtanner to be an animal product, a sort of honey or wax formed by a species of large ant called by Linnæus *formica rufa*. These ants, our author informs us, inhabit the old pine forests, where they sometimes form hills about six feet in diameter; and it is generally in these ancient forests, or in places where they have been, that fossile amber is found. This substance is not hard as that which is taken up in the sea at Prussia, and which is well known to naturalists. It has the consistence of honey or of half melted wax, but it is of a yellow colour like common amber; it gives the same product by chemical analysis, and it hardens like the other when it is suffered to remain some time in a solution of common salt. This accounts for the insects that are so often found inclosed in it. Among these insects ants are always the most prevailing: which tends farther, Mr Girtanner thinks, to the confirmation of his hypothesis. Amber then, in his opinion, is nothing but a vegetable oil rendered concrete by the acid of ants, just as wax is nothing but an oil hardened by the acid of bees; a fact incontestably proved, we are told, since Mr Metherie has been able to make artificial wax by mixing oil of olives with the nitrous acid, and which wax is not to be distinguished from the natural. Amber.

There are several indications which discover where amber is to be found. The surface of the earth is there covered with a soft scaly stone; and vitriol in particular always abounds there, which is sometimes found white, sometimes reduced into a matter, like melted glass, and sometimes figured like petrified wood.

Amber of the finest kind has been found in England. It is frequently thrown on the shores of Yorkshire, and many other places, and found even in the clay-pits; the pits dug for tile-clay, between Tyburn and Kensington gravel-pits, and that behind St George's Hospital at Hyde-park corner, have afforded fine specimens.

Poland, Silesia, and Bohemia, are famous for the amber dug up there at this time. Germany affords great quantities of amber, as well dug up from the bowels of the earth, as tossed about on the shores of the sea and rivers there. Saxony, Misnia, and Sweden, and many other places in this tract of Europe, abound with it. Denmark has afforded, at different times, several quantities of fossile amber; and the shores of the Baltic abound with it. But the countries lying on the Baltic afford it in the greatest abundance of all; and of these the most plentiful country is Prussia, and the next is Pomerania. Prussia was, as early as the times of Theodoric the Goth, famous for amber; for this substance coming into great repute with that prince, some natives of Prussia, who were about his court, offered their service to go to their own country, where that substance, they said, was produced, and bring back great stores of it. They accordingly did so; and from this time Prussia had the honour to be called the Country of Amber, instead of Italy, which had before undeservedly that title. This article alone brings his Prussian Majesty a revenue of 26,000 dollars annually. The amber of Prussia is not only found on the sea-coast, but in digging; and though that of Pomerania is generally brought from the shores, yet people who dig, on different occasions, in the very heart of the country, at times find amber.

Junker describes, after Neumann, the Prussian amber-mines, which are the richest known.—First, at the surface of the earth, is found a stratum of sand. Immediately under this sand is a bed of clay, filled with small flints of about an inch diameter each. Under this clay lies a stratum of black earth, or turf, filled with fossile wood, half decomposed, and bituminous; this stratum is extended upon a bank of minerals, containing little metal, except iron, which are consequently pyrites. Lastly, under this bed the amber is found, scattered about in pieces, or sometimes accumulated in heaps.

Amber has a subacrid resinous taste, and fragrant aromatic smell, especially when dissolved. It differs from the other bituminous substances in this, that it yields by distillation a volatile acid salt, which none of the others do; otherwise it affords the same sort of

principles

principles as them, viz. an acid phlegm, an oil which gradually becomes thicker as the diſtillation is continued; and when the operation is finiſhed, there remains a black caput mortuum in the retort.—When boiled in water, it neither ſoftens, nor undergoes any ſenſible alteration. Expoſed to the fire in an open veſſel, it melts into a black maſs very like a bitumen: It is partly ſoluble in ſpirit of wine, and likewiſe in ſome eſſential oils; but it is with difficulty that the expreſſed ones are brought to act upon it; the ſtronger ſorts of fixed alkaline lixivia almoſt totally diſſolve it.

This ſubſtance is principally of two colours, white and yellow. The white is the moſt eſteemed for medicinal purpoſes, as being the moſt odoriferous, and containing the greateſt quantity of volatile ſalt; tho' the yellow is moſt valued by thoſe who manufacture beads and other toys with it, by reaſon of its tranſparency.

Amber is the baſis of all varniſhes, by ſolution in the ways deſcribed under the article VARNISH.

Amber, when it has once been melted, irrecoverably loſes its beauty and hardneſs. There have been ſome, however, who pretend they had an art of melting ſome ſmall pieces of amber into a maſs, and conſtituting large ones of them: but this ſeems ſuch another undertaking as the making of gold; all the trials that have yet been made by the moſt curious experimenters, proving, that the heat which is neceſſary to melt amber, is ſufficient to deſtroy it. Phil. Tranſ. N° 248. p. 25.

Could amber indeed be diſſolved without impairing its tranſparency, or one large maſs be made of it by uniting ſeveral ſmall ones, it is eaſy to ſee what would be the advantages of ſuch a proceſs. The art of embalming might poſſibly be alſo carried to a great height by this, if we could preſerve the human corpſe in a tranſparent caſe of amber, as the bodies of flies, ſpiders, graſhoppers, &c. are to a great perfection. Something of a ſubſtitute of this kind we have in fine roſin; which being diſſolved by heat, and the bodies of ſmall animals ſeveral times dipped in it, they are thus coated with colophony, that in ſome degree reſembles amber; but this muſt be kept from duſt.

Amber in ſubſtance has been much recommended as a nervous and cordial medicine; and alledged to be very efficacious in promoting the menſtrual diſcharge, and the excluſion of the fœtus and ſecundines in labour: but as in its crude ſtate it is quite inſoluble by our juices, it certainly can have very little effect on the animal ſyſtem, and therefore it is now ſeldom given in ſubſtance. The forms in which amber is prepared are, A tincture, a ſalt, and an oil; the preparation and uſes of which are deſcribed in the proper place under the article PHARMACY.

AMBER-Tree, the Engliſh name of a ſpecies of ANTHOSPERMUM.

AMBERG, a city of Germany, the capital of the palatinate of Bavaria, with a good caſtle, ramparts, baſtions, and deep ditches. It is ſeated near the confines of Franconia, on the river Wils. It drives a great trade in iron and other metals, found in the neighbouring mountains. E. Long. 12. 4. N. Lat. 20. 46.

AMBERGRISE, AMBERGREASE, or GREY AMBER, in natural hiſtory, is a ſolid, opake, aſh-coloured, fatty, inflammable ſubſtance, variegated like marble, remarkably light, rugged and uneven in its ſurface, and has a fragrant odour when heated. It does not effervefce with acids; it melts freely over the fire, into a kind of yellow roſin; and is hardly ſoluble in ſpirit of wine.

It is found ſwimming upon the ſea, or the ſea-coaſt, or in the ſand near the ſea-coaſt; eſpecially in the Atlantic ocean, on the ſea-coaſt of Braſil, and that of Madagaſcar; on the coaſt of Africa, of the Eaſt Indies, China, Japan, and the Molucca iſlands; but moſt of the ambergriſe which is brought to England comes from the Bahama iſlands, from Providence, &c. where it is found on the coaſt. It is alſo ſometimes found in the abdomen of whales by the whale-fiſhermen, always in lumps of various ſhapes and ſizes, weighing from half an ounce to an hundred and more pounds. The piece which the Dutch Eaſt India Company bought from the king of Tydor, weighed 182 pounds. An American fiſherman from Antigua found ſome years ago, about 52 leagues ſouth-eaſt from the Windward iſlands, a piece of ambergriſe in a whale, which weighed about 130 pounds, and ſold for 500 l. Sterling.

There have been many different opinions concerning the origin of this ſubſtance.

It has been ſuppoſed to be a foſſile bitumen or naphtha, exuding out of the bowels of the earth in a fluid form, and diſtilling into the ſea, where it hardens and floats on the ſurface. But having been frequently found in the belly of whales, it has by others been conſidered as entirely an animal production.

Cluſius aſſerted it to be a phlegmatic recrement, or indurated indigeſtible part of the food, collected and found in the ſtomach of the whale, in the ſame manner as the BEZOARS are found in the ſtomachs of other animals.

In an account communicated by Paul Dudley, Eſq; in the 23d volume of the Philoſophical Tranſactions, the ambergiſe found in whales is repreſented as a kind of animal product, like muſk, and caſtoreum, &c. ſecreted and collected in a peculiar bag or bladder, which is furniſhed with an excretory duct or canal, the ſpout of which runs tapering into and through the length of the penis; and that this bag, which lies juſt over the teſticles, is almoſt full of a deep orange-coloured liquor, not quite ſo thick as oil, of the ſame ſmell as the balls of ambergriſe, which float and ſwim looſe in it: which colour and liquor may alſo be found in the canal of the penis; and that therefore ambergriſe is never to be found in any female, but in the male only. But theſe circumſtances are not only deſtitute of truth, but alſo contrary to the laws of the animal œconomy: For, in the firſt place, ambergriſe is frequently found in females as well as males; although that found in females is never in ſuch large pieces, nor of ſo good a quality, as what is found in males. Secondly, No perſon who has the leaſt knowledge in anatomy or phyſiology, will ever believe that organiſed bodies, ſuch as the beaks of the Sepia, which are ſo conſtantly found in ambergriſe taken out of the whale, can have been abſorbed from the inteſtines by the lacteals or lymphatics, and collected with the ambergriſe in the precluded bag abovementioned.

Kæmpfer, who has given us ſo many other faithful accounts in natural hiſtory, ſeems to come nearer the truth

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truth with regard to the origin of ambergrise, when he says, that it is the dung of the whale; and that the Japanese, for this reason, call it *kusura no fuu*, i. e. whale's dung. This account, however, though founded on observation, has never obtained credit, but has been considered rather as a fabulous story, with which the Japanese imposed upon him, who had himself no direct observation to prove the fact.

This matter, therefore, remained a subject of great doubt; and it was generally thought to be more probable, that ambergrise, after having been swallowed and somehow or other changed in the stomach and bowels of the whale, was found among its excrements.

But the most satisfactory account of the real origin of ambergrise, is that given by Dr Swediar in the 73d volume of the Philosophical Transactions, art. 15.

We are told by all writers on ambergrise, that sometimes claws and beaks of birds, feathers of birds, parts of vegetables, shells, fish, and bones of fish, are found in the middle of it, or variously mixed with it. Of a very large quantity of pieces, however, which the Doctor examined, he found none that contained any such thing; though he allows, that such substances may sometimes be found in it: but in all the pieces of any considerable size, whether found on the sea or in the whale, he constantly found a considerable quantity of black spots, which, after the most careful examination appeared to be the beaks of the *Sepia Octopodia*; and these beaks, he thinks, might be the substances which have hitherto been always mistaken for claws or beaks of birds, or for shells.

The presence of these beaks in ambergrise proves evidently, that all ambergrise containing them is in its origin, or must have been once, of a very soft or liquid nature, as otherwise those beaks could not so constantly be intermixed with it throughout its whole substance.

That ambergrise is found either upon the sea and sea-coast, or in the bowels of whales, is a matter of fact universally credited. But it has never been examined into and determined, whether the ambergrise found upon the sea and sea-coast is the same as that found in the whale, or whether they are different from one another? Whether that found on the sea or sea-coast has some properties, or constituent parts, which that found in the whale has not? And lastly, Whether that found in the whale is superior or inferior in its qualities and value to the former?

It is likewise a matter of consequence to know, Whether ambergrise is found in all kinds of whales, or only in a particular species of them? Whether it is constantly and always to be met with in those animals? And, if so, in what part of their body it is to be found?

All these questions we find very satisfactorily discussed by Dr Swediar.

According to the best information that he could obtain from several of the most intelligent persons employed in the spermaceti whale-fishery, and in procuring and selling ambergrise, it appears, that this substance is sometimes found in the belly of the whale, but in that particular species only which is called the *spermaceti whale*, and which from its description and delineation appears to be the *Physeter Macrocephalus* Linnæi.

The New England fishermen, according to their account, have long known that ambergrise is to be found in the spermaceti whale; and they are so convinced of this fact, that whenever they hear of a place where ambergrise is found, they always conclude that the seas in that part are frequented by this species of whale.

The persons who are employed in the spermaceti whale fishery, confine their views to the Physeter macrocephalus. They look for ambergrise in all the spermaceti whales they catch, but it seldom happens that they find any. Whenever they hook a spermaceti whale they observe, that it constantly not only vomits up whatever it has in its stomach, but also generally discharges its fæces at the time; and if this latter circumstances takes place, they are generally disappointed in finding ambergrise in its belly. But whenever they discover a spermaceti whale, male or female, which seems torpid and sickly, they are always pretty sure to find ambergrise, as the whale in this state seldom voids its fæces upon being hooked. They likewise generally meet with it in the dead spermaceti whales, which they sometimes find floating on the sea. It is observed also, that the whale, in which they find ambergrise, often has a morbid protuberance; or, as they express it, a kind of gathering in the lower part of its belly, in which, if cut open, ambergrise is found. It is observed, that all those whales, in whose bowels ambergrise is found, seem not only torpid and sick, but are also constantly leaner than others; so that, if we may judge from the constant union of these two circumstances, it would seem that a large collection of ambergrise in the belly of the whale is a source of disease, and probably sometimes the cause of its death. As soon as they hook a whale of this description, torpid, sickly, emaciated, one that does not dung on being hooked, they immediately either cut up the abovementioned protuberance, if there be any, or they rip open its bowels from the orifice of the anus, and find the ambergrise, sometimes in one sometimes in different lumps, of generally from three to twelve and more inches in diameter, and from one pound to twenty or thirty pounds in weight, at the distance of two, but most frequently of about six or seven feet from the anus, and never higher up in the intestinal canal; which, according to their description, is, in all probability, the intestinum cæcum, hitherto mistaken for a peculiar bag made by nature for the secretion and collection of this singular substance. That the part they cut open to come at the ambergrise is no other than the intestinal canal is certain, because they constantly begin their incision at the anus, and find the cavity every where filled with the fæces of the whale, which from their colour and smell it is impossible for them to mistake. The ambergrise found in the intestinal canal is not so hard as that which is found on the sea or sea-coast, but soon grows hard in the air: when first taken out it has nearly the same colour, and the same disagreeable smell, though not so strong, as the more liquid dung of the whale has; but, on exposing it to the air, it by degrees not only grows greyish, and its surface is covered with a greyish dust like old chocolate, but it also loses its disagreeable smell, and, when kept for a certain length of time, acquires the peculiar odour which is so agreeable to most people.

The gentlemen the Doctor conversed with confessed, that if they knew not from experience that ambergrise thus found will in time acquire the abovementioned

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qualities, they would by no means be able to distinguish ambergrise from hard indurated fæces. This is so true, that whenever a whale voids its fæces upon being hooked, they look carefully to see if they cannot discover among the more liquid excrements (of which the whale discharges several barrels) some pieces floating on the sea, of a more compact substance than the rest; these they take up and wash, knowing them to be ambergrise.

In considering whether there be any material difference between ambergrise found upon the sea or sea-coast, and that found in the bowels or among the dung of the whale, the Doctor refutes the opinion, that all ambergrise found in whales is of an inferior quality, and therefore much less in price. Ambergrise, he observes, is only valued for its purity, lightness, compactness, colour, and smell. There are pieces of ambergrise found on different coasts, which are of a very inferior quality; whereas there are often found in whales pieces of it of the first value; nay, several pieces found in the same whale, according to the abovementioned qualities, are more or less valuable. All ambergrise found in whales has at first when taken out of the intestines very near the same smell as the liquid excrements of that animal have; it has then also nearly the same blackish colour: they find it in the whale sometimes quite hard, sometimes rather softish, but never so liquid as the natural fæces of that animal. And it is a matter of fact, that, after being taken out and kept in the air, all ambergrise grows not only harder and whiter, but also loses by degrees its smell, and assumes such an agreeable one, as that in general has which is found swimming upon the sea; therefore the goodness of ambergrise seems rather to depend on its age. By being accumulated after a certain length of time in the intestinal canal, it seems even then to become of a whiter colour, and less ponderous, and acquire its agreeable smell. The only reason why ambergrise found floating on the sea generally possesses the abovementioned qualities in a superior degree, is because it is commonly older, and has been longer exposed to the air. It is more frequently found in males than females; the pieces found in females are in general smaller, and those found in males seem constantly to be larger and of a better quality; and therefore the high price in proportion to the size is not merely imaginary for the rarity-sake, but in some respect well founded, because such large pieces appear to be of a greater age, and possess the abovementioned qualities in general in a higher degree of perfection than smaller pieces.

It is known, that the Sepia octopodia, or cuttle-fish, is the constant and natural food of the spermaceti whale, or Physeter macrocephalus. Of this the fishers are so well persuaded, that whenever they discover any recent relics of it swimming on the sea, they conclude that a whale of this kind is, or has been, in that part. Another circumstance which corroborates the fact is, that the spermaceti whale on being hooked generally vomits up some remains of the Sepia. Hence it is easy to account for the many beaks, or pieces of beaks, of the Sepia found in all ambergrise. The beak of the Sepia is a black horny substance, and therefore passes undigested through the stomach into the intestinal canal, where it is mixed with the fæces; after which it is either evacuated with them, or if these latter be preternaturally retained, forms concretions with them, which render the animal sick and torpid, and produce an obstipation, which ends either in an abscess of the abdomen, as has been frequently observed, or becomes fatal to the animal; whence in both the cases, on the bursting of its belly, that hardened substance, known under the name of *ambergrise*, is found swimming on the sea, or thrown upon the coast.

From the preceding account, and his having constantly found the abovementioned beaks of the Sepia in all pieces of ambergrise of any considerable size, Dr Swediar concludes with great probability, that all ambergrise is generated in the bowels of the Physeter macrocephalus, or spermaceti whale; and there mixed with the beaks of the Sepia octopodia, which is the principal food of that whale. He therefore defines ambergrise to be the preternaturally hardened dung or fæces of the Physeter macrocephalus, mixed with some indigestible relics of its food.

The use of ambergrise in Europe is now nearly confined to perfumery, tho' it has formerly been recommended in medicine by several eminent physicians. Hence the Essentia Ambræ Hoffmanni, Tinctura Regia Cod. Parisini, Trochisci de Ambra Ph. Wurtemberg, &c.

If we wish to see any medicinal effects from this substance, the Doctor observes, we must certainly not expect them from two or three grains, but give rather as many scruples of it for a dose: though even then, he thinks, there would not be reason to expect much effect from it, as he had himself taken of pure unadulterated ambergrise in powder 30 grains at once, without observing the least sensible effect from it. A sailor, however, who had the curiosity to try the effect of recent ambergrise upon himself, took half an ounce of it melted upon the fire, and found it a good purgative; which proves that it is not quite an inert substance.

In Asia and part of Africa ambergrise is not only used as a medicine and as a perfume; but considerable use is also made of it in cookery, by adding it to several dishes as a spice. A great quantity of it is also constantly bought by the pilgrims who travel to Mecca; probably to offer it there, and make use of it in fumigations, in the same manner as frankincense is used in Catholic countries. The Turks make use of it as an aphrodisiac. Our perfumers add it to scented pillars, candles, balls or bottles, gloves, and hair powder; and its essence is mixed with pomatums for the face and hands, either alone or mixed with musk, &c. tho' its smell is to some persons extremely offensive.

Ambergrise may be known to be genuine by its fragrant scent when a hot needle or pin is thrust into it, and its melting like fat of an uniform consistence; whereas the counterfeit will not yield such a smell, nor prove of such a fat texture.—One thing, however, is very remarkable, that this drug, which is the most sweet of all the perfumes, should be capable of being resembled in smell by a preparation of one of the most odious of all stinks. Mr Homberg found, that a vessel in which he had made a long digestion of the human fæces, acquired a very strong and perfect smell of ambergrise, insomuch that any one would have thought a great quantity of essence of ambergrise had been made in it. The perfume was so strong and offensive, that the vessel was forced to be removed out of the elaboratory.

AMBERT

AMBERT, a small town of France, in lower Auvergne, the chief place of a small territory called *Livradois*. It is remarkable for its paper manufactory and camblets. E. Long. 3. 35. N. Lat. 45. 28.

AMBETTUWAY, in botany, a barbarous name of a tree, the leaves of which, when boiled in wine, are said to create an appetite, and is used by the people in Guinea with that intention.

AMBIANI, or AMBIANENSIS CIVITAS, now *Amiens*, a city of Picardy. It is called *Samarobriva* by Cæsar and Cicero; which, according to Valesius, signifies the bridge of the *Samara* or *Somme*. *Ambiani* is a later name, taken from that of the people, after the usual manner of the lower age.

AMBIDEXTER, a person who can use both hands with the same facility, and for the same purposes, that the generality of people do their right hands.—As to the natural ceuse of this faculty, some, as Hœfer, attribute it to an extraordinary supply of blood and spirits from the heart and brain, which furnish both hands with the necessary strength and agility: others, as Nicholas Massa, to an erect situation of the heart, inclining neither to the right hand nor left; and others to the right and left subclavian arteries being of the same height and the same distance from the heart, by which the blood is propelled with equal force to both hands.—But these are only conjecturers, or rather chimeras. Many think, that, were it not for education and habit, all mankind would be ambidexters; and in fact, we frequently find nurses obliged to be at a good deal of pains before they can bring children to forego the use of their left hands. How far it may be an advantage to be deprived of half our natural dexterity, may be doubted. It is certain, there are infinite occasions in life, where it would be better to have the equal use of both hands. Surgeons and oculists are of necessity obliged to be ambidexters; bleeding, &c. in the left-arm or left-ancle, and operations on the left-eye, cannot be well performed but with the left-hand.—Various instances occur in history, where the left hand has been excercised preferably to the right. But by the laws of the ancient Scythians, people were enjoined to exercise both hands alike; and Plato enjoins ambidexterity to be observed and encouraged in his republic.

AMBIDEXTER, among English lawyers, a juror or embracer, who accepts money of both parties, for giving his verdict; an offence for which he is liable to be imprisoned, for ever excluded from a jury, and to pay ten times the sum he accepted of.

AMBIENT, a term used for such bodies, especially fluids, as encompass others on all sides: thus, the air is frequently called an ambient fluid, because it is diffused round the earth.

AMBIGENÆ OVES, in the heathen sacrifices, an appellation given to such ewes as, having brought forth twins, were sacrificed together with their two lambs, one on each side. We find them mentioned among other sacrifices to Juno.

AMBIGENAL HYPERBOLA, a name given by Sir Isaac Newton to one of the triple hyperbolas of the second order, having one of its infinite legs falling within an angle formed by the assymptotes, and the other without.

AMBIGUITY, a defect of language, whereby words are rendered ambiguous. See the next article.

AMBIGUOUS, a term applied to a word or expression which may be taken in different senses.—An anonymous writer has published a dictionary of ambiguous words: *Lexicon Philosophicum de Ambiguitate Vocabulorum*, Francof. 1597. 4to.—The responses of the ancient oracles were always ambiguous.

AMBIT, in geometry, is the same with what is otherwise called the perimeter of a figure. See PERIMETER.

AMBIT was particularly used, in antiquity, to denote a space of ground to be left vacant betwixt one building and another. By the laws of the twelve tables, houses were not to be built contiguous, but an ambit or space of $2\frac{1}{2}$ feet was to be left about each for fear of fire.—The ambitus of a tomb or monument denoted a certain number of feet, in length and breadth, around the same, within which the sanctity assigned to it was limited. The whole ground wherein a tomb was erected was not to be secreted from the common uses; for this reason, it was frequent to inscribe the ambit on it, that it might be known how far its sanctity extended: thus, *in fronte pedes tot, in agrum pedes tot.*

AMBITION (*ambitio*), is generally used in a bad sense, for an immoderate or illegal pursuit of power.

In the strict meaning, however, of the word, it signifies the same with the *ambitus* of the Romans. See the next article.

Ambition, in the former and more usual sense, is one of those passions that is never to be satisfied. It swells gradually with success, and every acquisition serves but as a spur to further attempts.

"If a man (it has been well observed), could at once accomplish all his desires, he would be a miserable creature: for the chief pleasure of this life is to wish and desire. Upon this account, every prince who aspires to be despotic aspires to die of weariness. Searching every kingdom for the man who has the least comfort in life, Where is he to be found?—In the royal palace.—What! his majesty? Yes; especially if he be despotic."

AMBITUS, in Roman antiquity, the setting up for some magistracy or office, and formally going round the city to solicit the interest and votes of the people.

Ambitus different from *ambitio*, as the former lies in the act, the latter in the mind.

Ambitus was of two kinds; one lawful, the other infamous. The first, called also *ambitus popularis*, was when a person offered his service to the republic frankly, leaving it to every body to judge of his pretensions as they found reasonable. The means and instruments here made use of were various. 1. *Amici*, or friends, under different relations, including *cognati, offines, necessarii, familiares, vicini, tribules, clientes, municipes, sodales, collegæ*. 2. *Nomenclatura*, or the calling and saluting every person by his name; to which purpose, the candidates were attended with an officer, under the denomination of *intepres*, or *nomenclator*. 3. *Blanditia*; or obliging persons; by serving them, or their friends, patrons, or the like, with their vote and interest on other occasions. 4. *Prensatio*; the shaking every person by the hand, offering him his service, friendship, &c.—The second kind was that wherein force, cajoling, money, or other extraordinary influence, was made use of. This was held infamous, and severely punished, as a source of corruption and other mischiefs.

Ambitus was practised not only at Rome and in the forum, but in the meetings and assemblies of other towns in Italy, where numbers of citizens were usually found, on account of trade and business.—The practice ceased in the city from the time of the Emperors by reason posts were not then to be had by courting the people, but by favour from the prince.

Persons who had causes depending practised the same, going about among the judges to implore their favour and mercy. They who practised this were called *Ambitiosi*. Hence we also meet with *ambitiosa decreta*, and *ambitiosa jussa*, used for such sentences and decrees as were thus procured from the judges, contrary to reason and equity, either gratuitously or for money.

AMBLE, in horsemanship, a peculiar pace by which a horse's two legs of the same side move at the same time. See HORSEMANSHIP.

AMBLESIDE, a town in Westmoreland, seated at one end of Winandermeer, W. Long. 0. 49. N. lat. 54. 30.

AMBLETEUSE, a sea-port town of France, in Picardy, defended with a battery of cannon. E. long. 1. 30 N. lat. 49. 40.

AMBLYGON, in geometry, denotes an obtuse-angled triangle, or a triangle one of whose angles consists of more than 90 degrees.

AMBLYOPY, among physicians, signifies an obscuration of the sight, so that objects at a distance cannot be clearly distinguished.

AMBO, or AMBON, a kind of pulpit or desk, in the ancient churches, were the priests and deacons stood to read or sing part of the service, and preach to the people; called also *Analagium*. The term is derived from ἀναβαίνειν, "to mount."—The ambo was mounted upon two sides; whence some also derive the appellation from the Latin *ambo*, "both."

The ambo was ascended by steps; which occasioned that part of the office performed there to be called the *Gradual*. See GRADUAL.

Besides the gospel, which was read at the top of the ambo, and the epistle, which was read a step lower, they likewise published from this place the acts of the martyrs, the commemoration of departed saints, and the letters of peace and communion sent by one church to another: here, too, converts made a public profession of their faith; and bishops, their defence, when accused: treaties also were sometimes concluded, and the coronations of emperors and kings performed, in the same place.

The modern reading-desks and pulpits have been generally substituted to the ancient Ambos; though, in some churches, remains of the ambos are still seen. In that of St John de Lateran at Rome, there are two moveable ambos.

AMBOHITSMENE, or VOHITSANGHOMBE, a province of the island of Madagascar, so called from some red mountains of the same name, lying in S. Lat. 20°. These mountains are very high, resembling the Tafelburg of the Cape of Good Hope On one side of this ridge the sea extends into the country for fifteen leagues; on the other is a flat country abounding in ponds and marshes. Here is also a lake fifteen leagues in length, and the same in breadth, containing many small islands. The inhabitants of the mountains are called *Zaferahongs*; and have plenty of gold, iron, cattle, silk, &c.

AMBOISE, a town of France, in Touraine, seated at the confluence of the rivers Loire and Massee. The town is mean and ill built; but has been rendered famous in history by the conspiracy of the Protestants in 1560, which opened the fatal wars of religion in France. The castle is situated on a craggy rock, extremely difficult of access, and the sides of which are almost perpendicular. At its foot flows the Loire, which is divided into two streams by a small island. To this fortress the duke of Guise, when he expected an insurrection among the Hugonots, removed Francis II. as to a place of perfect security. Only two detached parts of the ancient castle now remain, one of which was constructed by Charles VIII. and the other by Frances I. The former of those princes was born and died at Amboise. The town is situated E. Long. 1. 30. N. Lat 47. 25.

AMBOULE, a province of Madagascar, somewhat to the northward of S. Lat 23°. It is a fertile and agreeable country, watered by the river Manampani, whose mouth lies in S. Lat. 23. 30. The country produces plants and fruits in plenty. Iron mines are also found here. The black cattle are extremely fat, and their flesh excellent. In this province stands a large town of the same name; near which is a foutain of hot water, within 20 feet of a small river whose sand is almost burning. The water of the fountain is said to boil an egg hard in two hours; and the inhabitants affirm it to be a sovereign remedy against the gout. The people here are employed in different preparations of iron and steel, which they have from their own mines, and forge several instruments with tolerable skill. Their governor is honoured with the tile of *Rabertau*, or *Great Lord*. He exercises sovereign authority and absolute power; but is frequently, in times of distress, surprised by his subjects, who assemble in great numbers, seize his person, and threaten him with death unless they are relieved. To extricate himself from this dilemma, he is instantly obliged to issue orders for distributing provisions among them; but is usually repaid with interest, a quadruple return being made in a plentiful harvest. The people of Amboule live in great licentiousness with their superiors, and their country is generally a retreat for the roguish and lazy.

AMBOYNA, one of the Molucca islands, in the East Indies. It lies in S. Lat. 3. 36. and E. Long. 126. 20. and is remarkable for being the centre of the commerce for nutmegs and cloves, which is entirely monopolized by the Dutch East-India company. It is about 24 leagues in circumference. Besides cloves, it likewise abounds in most of the tropical fruits and fish; nor is there here any deficiency of good water; but fish is very scarce. This scarcity, however proceeds more from the policy of the Dutch than either the intemperature of the climate or the barrenness of the soil: For, excepting cloves, they have in Amboyna,

Amboyna. na, as well as the Moluccas, industriously discouraged the cultivation of every esculent commodity, with the view of with-holding subsistence from those who might be tempted to invade them.

Of the natives, the men wear large whiskers, but leave little hair upon their chin; and have only a slight piece of stuff wrapped round their middle. The women tie their hair in knots: the maids are bought of their fathers before they are married; and if the wife proves barren, the marriage is dissolved. Some of the natives are Mahometans, and some Christians: but they are all said to be lazy, deceitful, and treacherous. They make war with small swift vessels, in shape like dragons with regard to the head and tail. Their houses are built of bamboo-canes and sago-trees. They sleep on mats. Their weapons are bows and arrows, javelins, scymitars, and targets.

Amboyna was first discovered by the Portuguese, who built a fort upon it, which was taken from them by the Dutch in 1605. They did not, however, become masters of the whole island at once. The English had here five factories, which lived under the protection of the Dutch castle; holding themselves safe, in respect of the friendship between the two nations. Great differences had arisen between the Dutch and English colonists in this part of the world; till at last, the English East-India company applying to king James, a treaty was concluded in 1619, by which the concerns both of the English and Dutch were regulated, and certain measures agreed upon for preventing future disputes. This was an additional security to the English; and, by virtue of the treaty, they continued two years in Amboyna, trading with the Dutch. During this time, however, several disputes happened; which occasioning mutual discontents, the complaints were sent to Jaccatra, in the island of Java Major, to the council of defence of both nations there residing: but they not agreeing, a state of the matter was sent over to Europe, to be decided by the East-India companies of both nations; or, in case they could not agree, by the King of England and the States of Holland, according to an article in the treaty of 1619.—But before these disputes could be decided in a legal way, the Dutch, in order to give the more specious colouring to the violent seizure which they meditated of the island of Amboyna, made use of the stale pretext of a conspiracy being formed by the English and Japanese to dispossess them of one of their forts in this place. The plot, it was alleged, had been confessed by a Japanese and Portuguese in the English service, who were most inhumanly tortured till they should answer in the affirmative such interrogatories as might favour the secret design of those cruel inquisitors. Upon the injurious evidence of this constrained declaration, they immediately accused the English factors of the pretended conspiracy. Some of them they imprisoned, and others they loaded with irons and sent on board their ships; seizing at the same time all the English merchandize, with their writings and books.

These acts of violence were followed by a scene of horror unexempled in the punishment of the most atrocious offenders. Some of the factors they tortured, by compelling them to swallow water till their bodies were distended to the utmost pitch; then taking the miserable victims down from the boards to which they had been fastened, and causing them to disgorge the water; if they did not acknowledge the imputed guilt, the process of torture was repeated. Others of the English they consumed by burning them gradually from the feet upwards, in order to extort the confession of a conspiracy, which was only pretended by the infernal policy of those savage tormentors. Some had the nails of the fingers and toes torn off; and in some they made holes in their breasts, filling the cavities with inflammable materials, to which they afterwards put fire. Those who did not expire under the agonies of torture were consigned to the hands of the executioner.

The allegation of this pretended conspiracy was equally void of probability and truth. The Dutch had a garrison of 300 men in the fort, besides the burghers in the town, and several other forts and garrisons in the island, while the numbers of the English did not amount to 20 men; nor were even those provided with arms or ammunition to effect such a design as that with which they were charged. There likewise was not one English vessel in the harbour, whereas the Dutch had eight ships riding near the town: neither, when the Dutch broke open the desks and trunks of the factors, were there found a single paper or letter which could be construed into the most distant relation to any conspiracy. Add to all this, that such of the unhappy sufferers as could speak to be heard, declared in the most solemn manner their innocence of the plot with which they were charged.

The whole of the transaction affords the most irrefragable testimony that it was founded entirely upon a political fiction of the Hollanders, who had themselves formed the design of monopolizing the trade of the Spice Islands; for the accomplishment of which they perpetrated, about the same time, a similar tragedy at Pooleron, where they put to the torture 162 of the natives, whom they likewise charged with a pretended conspiracy. It may justly be reckoned singular in the fortune of this commercial republic, that they have ever since been permitted to enjoy in peace those invaluable islands, which were originally obtained by such atrocious infringements of humanity and the laws of nations as will stain the Dutch annals, to the latest ages, with indelible infamy.

The more effectually to preserve this trade, the Dutch have had all the clove-trees in the adjacent islands grubbed up. Sometimes also, when the harvest is very large, part of the produce of Amboyna itself is burnt. —To prevent the rearing of cloves in any of the neighbouring islands, or the inhabitants from selling them to strangers, the governor of Amboyna makes the tour of his government with a fleet of curricurries, consisting sometimes of 20, and at others of 30, 40, or 50 sail. This expedition is made with all the pomp imaginable, in order to gratify the pride and folly of the Indian chiefs. The true reason of their taking all this pains is, because experience has shown, that no contracts, however solemn, can prevent the inhabitants of those islands from selling their spice to strangers; and even now, frauds are so frequently practised by the Dutch themselves, though the company is inexorable in punishing them, that the common people call the cloves *galgen-kruid*, that is, the gallows-spice.

Besides the cloves, coffee is also cultivated here by

 the

Ambracia.

the Dutch, and a gold mine has been lately found out. This was discovered by the quantities of gold-dust that were washed from some mountains by the torrents. Here also grow several kinds of valuable wood, of which they made tables, chairs, escritoirs, &c. for the principal persons in the government; and the rest is sold all over the Indies at a very extravagant rate.

Amboyna is divided into two parts, viz. a greater and lesser peninsula. The former, called *Hiton*, is 12 leagues in length, and two and a half broad. In this the Dutch have no less than five forts, or rather strong redoubts, mounted with canon. The other is called *Leytimor*, five leagues in length, and one and a half broad, which is the southern part of the island; on this stands the fort of Victoria, which is the residence of the governor, and his council, composed of 15 gentlemen or merchants. The fortress is a square, the ramparts mounted with 60 pieces of brass cannon, and the garrison usually composed of 600 men. It is so strong by nature and art, as to be in a manner impregnable; and so effectually does it command the harbour, that no vessel could come in or go out without being sunk by the canon, if the governor chose. The inhabitants of Amboyna are computed at 70 or 80,000, of whom but a small number are Dutch; and this obliges the latter to be continually upon their guard, and to keep a competent number of troops in each of their forts, particularly in that of Middleburgh, which stands upon the isthmus that connects these peninsulas. There are also redoubts and garrisons in all the islands of this government.

AMBRACIA; one of the most considerable cities of ancient Epirus, situated on the river Arachus, at a small distance from the sea. At first it was a free city; but was afterwards reduced by the Æacidæ kings of Epirus, who chose it for the place of their residence. In process of time, the Ætolians made themselves masters of it, and held it till the year before Christ 189, when it fell into the hands of the Romans.

At this time Ambracia was a place of great strength. It was defended on one side by the river Arachus, and on the other by steep and craggy hills; and surrounded with an high and thick wall, above three miles in compass. The Roman consul Fulvius began the siege by forming two camps, separated by the river, but with a communication between them; the Romans were posted in one, and the Epirots their allies in the other. He then threw up two lines, one of circumvalation, and the other of contravallation; and built a wooden tower, in form of a castle, over against the citadel, which stood on a hill. The Ætolians, however, before the lines were quite finished, found means to throw about 1000 men into the place.

The lines being completed, the city was attacked in five different places at once. The battering-rams shook the walls on all sides; and the Romans, from their moveable towers, pulled down the battlements with a kind of scythes which they fastened to long beams. The besieged made a vigorous defence. They were night and day on the walls, and indefatigable in preventing the effects of the rams and scythes. The strokes of the former they deadened, by letting down beams, large stones, lumps of lead, &c. by means of pullies, upon them when they were in motion; the others they rendered useless, by pulling the beams which they were fastened into the city with hooks contrived for the purpose.

Ambracia.

While Fulvius was carrying on the siege, Nicander the Ætolian prætor found means to throw 500 men into the city, under the command of one Nicodamus, with whom Nicander agreed to attack the Roman camp in the night-time; not doubting, that, if the garrison from within, and the army from without, fell upon them at the same time they would be obliged to raise the siege. Nicodamus narrowly watched the time at which he was ordered to sally; and though Nicander did not appear, marched out at the head of the garrison, armed with fire-brands and torches. The Roman centinels, surprised at this sight, ran to wake the legionaries, and soon spread a general alarm all over the camp. The legionaries marched in small bodies as they happened to meet, to repulse the enemy, whom they engaged in three different places. Two parties of the garrison were driven back: but the third, commanded by two Ætolian generals, made a great slaughter of the Romans; and, not finding themselves seconded by Nicander, retired in good order into the city.

Though the besieged were thus abandoned, and had no hopes of assistance, they continued to defend themselves with incredible vigour and resolution. The Romans had no sooner made a breach in the wall, but it was repaired, and a new one built behind it. The consul, therefore, altered his measures; and, instead of making breaches with the ram, began to undermine the wall, in hopes of throwing down great part of it at once, and entering the city before the besieged could have time to rebuild a new wall. The miners being covered, were not observed by the garrison, till the great quantities of earth brought out of the mine gave the alarm. The Ætolians immediately began a countermine; and having dug a trench of the depth they supposed the mine to be, they carried it along the wall where they heard the strokes of the pick-axes of the Romans. When the two mines met, a battle ensued, first with pick-axes and spades, and then with swords and spears: but this attack did not last long, each party making themselves a kind of rampart with the loose earth. The Ætolians, in order to drive their enemies quite out of the mine, invented a machine, which they brought to the place where the two mines met: this was an hollow vessel with an iron bottom, bored through in many places, and armed with spikes at proper distances to prevent the enemy from approaching it: this vessel they filled with feathers, which they set on fire, and with bellows driving the smoke on the besiegers, obliged them to leave the mine, half-suffocated. This interval the Ætolians made use of in repairing the foundations of the wall.

The vigorous resistance made by the Ambracians, however, did not raise the courage of the nation in general, who were determined on a peace with Rome at all events. Fulvius, in the mean time, being desirous of getting possession of Ambracia before the conclusion of the peace, employed Amynander, king of the Athamanes, to persuade the inhabitants to surrender. As Amynander had great interest in Ambracia, having long resided there, he easily persuaded them to capitulate on the following terms, viz. That the Ætolian garrison should have leave to march out of the city; that the

inhabitants

inhabitants should pay 500 talents, 200 down, and the rest at six equal payments; and that they should deliver to the consul all the prisoners and deserters that were in the city. The gates were then opened to Fulvius; and he was presented with a crown of gold, together with many fine statues and pictures, of which there were great numbers in the city, it having been the capital of Pyrrhus, who had enriched it with many valuable monuments.

From this time the city of Ambracia made no figure in history. It is scarce known at present where the city stood; but that called *Arba*, in upper Albania, seems best to agree with what is said of the ancient situation of this city. The river Aracthus, on which Ambracia was situated, is now called, by the natives, *Spagmagmurisi*.

AMBREADA, thus they call the false or factitious amber, which the Europeans use in their trade with the negroes on the coast of Africa, and particularly on the river Senegal. There are some large and red pieces of it, a thousand of which making twenty ropes or strings, weigh three pounds. There are others small, and also red, which weigh but two pounds and an half.

AMBRESBERRY, a market-town in Wiltshire, about six miles north of Salisbury, and situated in W. Long. 1. 40. and N. Lat. 51. 20.

AMBRONES, a Gaulish people who lived near the foot of the Alps, between Switzerland and Provence. They invaded the Roman territories in conjunction with the Cimbri and Teutones; but were defeated with great slaughter by Marius, about 101 years before Christ. Their women, who had staid during the engagement in a kind of fortification made with their carts, on seeing their husbands flying, and the Romans at their heels, armed themselves with axes, and gnashing with their teeth, fell with fury on the pursuers and the pursued. Their first rage being spent, they desired to surrender themselves, upon the single condition, that their chastity should not be violated; but this equitable request being denied, they first killed their children, and then themselves, not one remaining alive out of the whole multitude.

AMBROSE-ISLAND, a small island laid down in some of the most approved charts, and particularly mentioned in Mr Robertson's Elements of Navigation, as lying in S. Lat. 25. 30. W. Long. 82. 20. It was searched for, however, in 1767, by Captain Carteret, with such diligence, that he concludes it to have no existence, as he could not discover land any where near that place.

AMBROSE (St), bishop of Milan, one of the most eminent fathers of the fourth century, born in Gaul in the year 333, according to Dr Cave, or in 340, as Mr Du Pin affirms. His father was at this time *præfectus prætorio* in Gaul; and resided at Arles, the capital of Gallia Narbonensis. The birth of Ambrose is said to have been followed with a remarkable presage of his future eloquence; for we are told, that a swarm of bees came and settled upon his mouth as he lay in his cradle. He soon made himself master of the several parts of secular learning; and pleaded causes before Probus with so much eloquence, that he was appointed his assessor, and soon after governor of the provinces of Liguria and Æmilia. He settled at Milan; where, in the year 374, upon the death of Auxentius bishop of that city, there being a great contest between the Catholics and Arians concerning the choice of a new bishop, Ambrose thought it his duty, as governor, to go to the church, in order to compose the tumult. He accordingly addressed himself to the people in a gentle pathetic speech, exhorting them to proceed to their choice in a calm and friendly manner: while he was speaking to them, the whole assembly cried out with one voice, "Let Ambrose be bishop!" Such a sudden and unexpected incident surprised him extremely; so that he retired immediately, and used every method to divert them from their resolution of choosing him; but at last he was obliged to comply; and was baptised (being but a catechumen before), and ordained bishop, towards the latter end of the year 374, or beginning of 375. About the year 377, the barbarous nations making an incursion into the Roman empire, he fled to Illyricum, and afterwards to Rome. In the year 384, he was sent to the tyrant Maximus, who had usurped the empire, and prevailed upon him not to pass over into Italy. The heathens being encouraged by these intestine commotions in the empire, attempted to restore their religion, and employed Q. Aurelius Symmachus, prefect of Rome, a man of great eloquence, to plead their cause. This gave rise to the famous contest between St Ambrose and him, about repairing the altar of Victory. But Symmachus having lost his cause, was expelled the city, and commanded not to approach within an hundred miles of it. The petition which he presented to the emperor Valentinian the younger, is still extant; we find in it the strongest figures of rhetoric and the greatest force of eloquence. St Ambrose wrote a confutation of this petition; but he has been thought guilty of many paralogisms: and yet he protests, "that he endeavoured only after the solidity of reasoning, leaving Symmachus all the glory of eloquence and politeness; it being (says he) the peculiar privilege of the pagan philosophers to amuse the mind with colours as false as their idols; and to say great things, not being capable of saying true ones." Ambrose met with a good deal of opposition from the Arians, against whom he acted with great spirit and intrepidity. Justina the empress and mother of Valentinian, who was an Arian, resolving to restore Arianism at Milan, began with demanding of St Ambrose one of the churches, which was called the Portian church: but he refused it; and the people surrounding the palace in a body, she was obliged to leave him in possession of his church, and even desire him to pacify the people.

Ambrose was a second time sent to the tyrant Maximus, for Valentinian found no person so proper to negotiate with him. He spoke to him with great courage and boldness, but could obtain nothing; for Maximus soon after marched into Italy, and made himself master of the western empire: so that Valentinian was obliged to retire, with his mother Justina and his sister Galla, to Thessalonica in Illyricum, in order to desire Theodosius's assistance; who defeated Maximus, and restored Valentinian to the empire.

While Theodosius continued in Italy, after the defeat of Maximus, an insurrection happened at Thessalonica, in which several of the magistrates were stoned, and their bodies dragged along the streets. Theodosius being informed of this, rashly commanded a certain number of the inhabitants to be put to death promiscuously;

cuously; by which means the city was filled with the blood of many innocent persons, and amongst the rest several strangers who had but just come there: no regard was had to any distinction of persons, no form of trial was observed; but they were cut down like corn in the harvest, as Theodoret expresses it, to the number of 7000. At this time an assembly of bishops was held at Milan, who all expressed an abhorrence of such cruelty in the emperor. Ambrose wrote a letter to him, in which he represented the enormity of his crime, and exhorted him to make satisfaction by a sincere submission and repentance. Some time after, Theodosius coming to Milan, went to receive the sacrament at the great church; where Ambrose meeting him at the door, denied him entrance, and represented his guilt in the most forcible and pathetic terms. The emperor was struck with his words, and with great uneasiness of mind returned to his palace; but about a year after, Ambrose, being convinced of the sincerity of his repentance, admitted him into the church.

In 392, Valentinian the emperor being assassinated by the contrivance of Argobastes, and Eugenius usurping the empire, Ambrose was obliged to leave Milan: but he returned the year following, when Eugenius was defeated. He died at Milan the 4th of April 797; being 57 years of age, according to Mr Du Pin and some other writers; but Dr Cave and Olearius say that he was 64 years old at his death. He was buried in the great church at Milan. He wrote several works, the most considerable of which is that *De Officiis*. He is concise and sententious in his manner of writing, and full of turns of wit; his terms are well chosen, and his expressions noble: he diversifies his subject by an admirable copiousness of thought and language; he is very ingenious in giving an easy and natural turn to every thing which he treats of, and is not without strength and pathos when there is occasion for it. This is part of the character which Du Pin gives him as a writer; but Erasmus observes that he has many quaint and affected sentences, and frequently very obscure ones; and it is certain that his writings are intermixed with many strange and peculiar opinions. Paulinus wrote his life, and dedicated it to St Augustin: this life is prefixed to St Ambrose's works; the best edition of which is reckoned to be that published by the Benedictine monks, in two volumes in folio, at Paris, in 1686 and 1690.

AMBROSE (Isaac), an eminent presbyterian minister, was educated at Brazen-nose college Oxford, where he took the degree of bachelor of arts, and became minister of Preston, and afterwards of Garstan in Lancashire, where he was in 1662 ejected for non-conformity. It was usual with him to retire every year for a month into a little hut in a wood; where he shunned all society, and devoted himself to religious contemplation. Dr Calamy observes, that he had a very strong impulse on his mind of the approach of death, and took a formal leave of his friends at their house a little before his departure; and the last night of his life he sent his discourse concerning *angels* to the press. The next day he shut himself up in his parlour, where, to the great surprise and regret of all who saw him, he was found just expiring. He died in 1663-4, in the 72d year of his age. He wrote several other books; as the *Prima, Media, et Ultima*, or the First, Middle, and last Things; War with devils; Looking unto Jesus; &c.

AMBROSE, or St AMBROSE *in the Wood*, an order of religious, who use the Ambrosian office, and wear an image of that saint engraven on a little plate: in other respects, they conform to the rules of the Augustins. See AMBROSIAN *Office*, and AUGUSTINS.

AMBROSIA, in heathen antiquity, denotes the solid food of the gods, in contradistinction from the drink, which was called *nectar*. It had the appellation *ambrosia* (compounded of the particle α, and βροτος, *immortal*,) as being supposed to render those immortal who fed on it.

AMBROSIA is also a splendid kind of title, given by some physicians to certain alexipharmic compositions, of extraordinary virtue. The name was particularly given to a famous antidote of Philip of Macedon, against all poisons, bites, and stings of venomous creaas well as many internal diseases.

AMBROSIA; A genus of the pentandria order, belonging to the monœcia class of plants; and, in the natural method, ranking under the 49th order, *Compositæ-nucamentaceæ*. The characters are:—The MALE flowers are compound: The common *calyx* is a single-leaved perianthium, the length of the florets: The compound *corolla* is uniform, tubular, flat, and hemispherical; the proper is monopetalous, funnel-shaped, and quinquefid: The *stamina* consist of five very small filaments; the antheræ are erect, parallel, and pointed: The *pistillum* has a filiform stylus, the length of the stamina; the stigma orbicular and membranous: The *receptaculum* is naked.—FEMALE flowers below the male ones, on the same plant, doubled: The *calyx* is a single leaved perianthium, entire (with the belly quinquedentated), one flowered, and persistent: There is no *corolla*: The *pistillum* has an ovate germen in the bottom of the calyx; a filiform stylus, the length of the calyx; and two long bristly stigmata: The *pericarpium* is an ovate unilocular nut: The *seed* is singular and roundish. Of this genus five species are enumemerated; but having no properties worthy of notice, we omit any further account of them.

AMBROSIAN OFFICE, OR RITE, in church-history, a particular formula of worship in the church of Milan, which takes its name from St Ambrose, who instituted that office in the fourth century. Each church originally had its particular office; and when the Pope, in aftertimes, took upon him to impose the Roman office upon all the western churches, that of Milan sheltered itself under the name and authority of St Ambrose; from which time the Ambrosian ritual has prevailed.

AMBROSIN, in middle-aged writers, denotes a coin struck by the lords or dukes of Milan, whereon was represented St Ambrose on horseback with a whip in his right hand. The occasion of this coinage is said to have been a vision of that saint, who appeared to the Milanese general in 1339, during the time of a battle.

AMBROSINIA, in botany; a genus of the polyandria order, belonging to the gynandria class of plants; the characters of which are: The *calyx* is a single-leaved spatha, divided by a partition into two cells: There is no *corolla*: The *stamina* consist of a single filament in the interior cell; the antheræ are numerous,

numerous, with two roundish concave nectaries at their base: The *pistillum* is in the interior cell; the germen roundish; the stylus cylindrical, and shorter than the spatha: the stigma obtuse: The *percarpium* (a capsule?) roundish and unilocular. There is but one species, a native of Turkey.

AMBROSIUS AURELIANUS, or AURELIUS AMBROSIUS, a famous general of the ancient Britons, of Roman extraction. He was educated at the court of Aldroen of Amorica; who, at the request of the Britons, sent him over with ten thousand men, to assist them against the Saxons, whom Vortigern had invited into Britain. Ambrosius had such success against the Saxons that the Britons choose him for their king, and compelled Vortigern to give up to him all the western part of the kingdom divided by the Roman highway called *Watling-street*. Some time after, the Britons being discontented with Vortigern, and having withdrawn their allegiance from him, he retired to a castle in Wales, where being besieged by Ambrosius, and the castle taking fire, he perished in the flames, and left his rival sole monarch of Britain; who now took upon him the imperial purple, after the manner of the Roman emperors. Geoffrey of Monmouth tells us, that Ambrosius built Stonehenge near Salisbury in Wiltshire. Ambrosius, according to this historian, coming to a monastery near Caercaradoc, now Salisbury, where three hundred British lords, massacred by Hengest, lay buried, and resolving to perpetuate the memory of this action, he ordered his workmen to prepare a large quantity of stones and other materials. But having, at the instignation og Tremonus archbishop of Caerleon, consulted the famous Merlin, this magician advised him to send over to Ireland for certain great stones, called *chorea gigantum*, the giant's dance, placed in a circle on a hill called *Killair*, having been brought thither by giants from the farthest borders of Africa. A body of forces were accordingly sent into Ireland, under Pendragon, Ambrosius's brother, to fetch these stones; but were opposed in their attempt by Gillomanus king of the country, who derided the folly of the Britons in undertaking so ridiculous an expedition. Neverthelefs, the Britons having vanquished this prince in battle, brought away the stones; and by the direction and assistance of Merlin, who had accompanied them, these wonderful stones, by order of Ambrosius, were placed over the graves of the British lords, and are now what is called *Stonehenge*. Alexander Mechan celebrates this fable in his poem *De divinæ sapientiæ laudibus*. Polydore Virgil assigns another origin of Stonehenge: he tells us it was erected by the Britons as a monument to their general Ambrosius, on the place where he fell in battle, to perpetuate the memory of his glorious actions and services done to his country. Both these stories are rejected by the best antiquaries; who, however, are by no means agreed as to the true origin of this famous piece of antiquity. See STONEHENGE.

After the Britons had defeated the Saxons, and obliged them to retire northward, Ambrosius is said to have convened the princes and great men at York, where he gave orders for repairing the churches destroyed by the Saxons, and restoring the exercise of religion to its former lustre. This is confirmed by Matthew of Westminster; who highly applauds the great zeal of Ambrosius in repairing the churches, encouraging the clergy, and restoring the honour of religion. The Monmouth historian gives this prince a very high character. "He was a man (says he) of such bravery and courage, that when he was in Gaul no one durst enter the lists with him; for he was sure to unhorse his antagonist, or to break his spear into shivers. He was, moreover, generous in bestowing, careful in performing religious duties, moderate in all things, and more especially abhorred a lie. He was strong on foot, stronger on horseback, and perfectly qualified to command an army." The same author tells us he was poisoned at Winchester by one Eopa a Saxon, disguised as a physician, and hired for that purpose by Pascentius one of the sons of Vortigern: but the generally received opinion is, that he was killed in a battle which he lost in the year 508, against Cerdric, one of the Saxon generals.

AMBRY, a place in which are deposited all the utensils necessary for house-keeping. In the ancient abbeys and priories, there was an office under this denomination, wherein were laid up all charities for the poor.

AMBUBAJÆ, in Roman antiquity, were immodest women, who came from Syria to Rome, where they lived by prostitution and by playing on the flute: the word is derived from the Syriac *abub*, which signifies a flute; altho' others make it to come from *am* and *Baiæ*, because these prostitutes often retired to Baiæ. According to Cruquius, these women used likewise to sell paint for ornamenting the face, &c.

AMBULANT, or AMBULATORY. They give in France the name of *ambulant commissioners* to those commissions, or clerks of the king's farms, who have no settled office; but visit all the offices within a certain district, to see that nothing be done in them against the king's right, and interest of the farm.

AMBULANT is also used to denote those brokers at Amsterdam, or exchange agents, who have not been sworn before the magistrates. They transact brokerage business, but their testimony is not received in the courts of justice.

AMBULATORY, a term anciently applied to such courts, &c. as were not fixed to any certain place; but held sometimes in one place, and sometimes in another. In opposition to stationary courts.—The court of parliament was anciently ambulatory; so also were the court of king's bench, &c.

AMBURBIUM, in Roman antiquity, a procession make by the Romans round the city and pomœrium, in which they led a victim, and afterwards sacrificed it, in order to avert some calamity that threatened the city.

AMBURY, or ANBURY, among farriers, denotes a tumor, wart or swelling, which is soft to the touch, and full of blood.

This disorder of horses is cured by tying a horse-hair very hard about its root; and, when it has fallen off, which commonly happens in about eight days, strewing some powder of verdigris upon the part, to prevent the return of the complaint. If the tumor be so low that nothing can be tied about it, they cut it out with a knife, or else burn it off with a sharp hot iron; and, in sinewy parts, where a hot iron is improper, they eat it away with oil of vitriol, or white sublimate.

Many of our farriers boast of a secret which infallibly cures all kinds of protuberances of this kind; the preparation of which is this, Take three ounces of green vitriol and one ounce of white arsenic; beat them to a coarse powder, and put them into a crucible; place the crucible in the midst of a charcoal fire, stirring the substance, but carefully avoiding the poisonous steams; when the whole grows reddish, take the crucible out of the fire, and when cool, break it and take out the matter at the bottom; beat this to powder in a mortar, and add to four ounces of this powder five ounces of *album rhosis;* make the whole into an ointment, and let it be applied cold to warts; rubbing them with it every day. They will by this means fall off gently and easily, without leaving any swellings. It is best to keep the horse quiet, and without working, during the cure. What sores remain on the parts which the swellings fall off from, may be cured with the common application called the *countess's ointment.*

AMBUSCADE, or Ambush, in the military art, properly denotes a place where soldiers may lie concealed till they find an opportunity to surprise the enemy.

In the language of Scripture, these terms are not always taken in their proper signification, for laying ambushes for any one, attacking him in secret, laying snares for him. They sometimes signify no more than attacking a man who has no distrust of such a thing: attacking one behind, concealing one's self in some particular place in order to surprise any one. See the book of Judges, ch. ix. 25. 32. 34, 35. Abimelech, who lay lurking with his people in the heights of Sichem, so, however, as to rob and treat those who passed that way very ill, came and attacked the city of Sichem with his troops divided into three bodies: *Tetendit insidias juxta Sichimam in quatuor locis.* Literally, according to the Hebrew, "They prepared ambuscades against Sichem in four heads or companies." And a little farther, verse 43. Abimelech being informed that the Sichemites were marched, took his army and divided it into three bodies, and laid wait for them in the field." It seems certain, that in these passages, ambushes, properly so called, were not the things in question. In the first book of Samuel, Saul complains that David laid ambuscades for him: *Insidiator usque hodie permanens.* Now nothing could be worse grounded than this accusation, if we understand the word *insidiari* in its proper signification; but he might say, though unjustly, that David was his secret enemy. And in the Chronicles it is said, that God turned the ambushes laid by the enemies of Israel upon themselves; that is to say, their endeavours, their malice, their arms, he turned against themselves: for the enemies there mentioned came not in private or by stratagem; they marched openly in arms against Israel.

AMBY, a town of the Austrian Netherlands, in the province of Limburg, situated opposite to Maerstricht, on the east side of the river Maese, in E. Long. 5. 45. N. Lat. 50. 57.

AMEDIANS, in church-history, a congregation of religious in Italy, so called from their professing themselves *amantes Deum,* "lovers of God;" or rather *amati Deo,* "beloved of God." They wore a grey habit and wooden shoes, had no breeches, and girt themselves with a cord. They had 28 convents; and were united by Pope Pius V. partly with the Cistercian order, and partly with that of the Soccolanti, or wooden-shoe wearers.

AMELIA, an episcopal city of Italy, in the state of the church, seated on a mountain, 50 miles N. E. of Rome, and 25 miles S. W. of Spoletto. E. Long. 13. 20. N. Lat. 42. 33.

AMELLUS, Starwort: A genus of the polygamia superflua order, belonging to the syngenesia class of plants; and in the natural method ranking under the 42th order, *Compositæ-oppositifoliæ.* The characters are: The common *calyx* is imbricated and roundish: The *compound corolla* is radiated; the hermaphrodite corollets numerous in the disk; the female numerous in the ray: *Proper* corolla of the hermaphrodites are tubular and quinquefid; of the females, tongued, loose, and two or three toothed: The *stamina* in the hermaphrodites consist of five short capillary filaments; the antheræ cylindric and tubular: The *pistillum* has an ovate germen; a filiform stylus the length of the stamina; and two filiform stigmata: There is no *pericarpium,* but the calyx unchanged: The *seeds* are ovate and solitary; the *pappus* is hairy; the *receptaculum* chaffy.—Of this there are two.

Species. 1. The lynchitis, with one flower on each footstalk. This is a native of the Cape of Good Hope. It is a perennial plant, rising about three feet high, sending out many branches on each side, so as to form a bushy plant; the branches are garnished with obtuse spear-shaped leaves placed opposite, and are terminated by single naked flower-stalks, each supporting one violet-coloured flower, having a yellow disk, which is succeeded by oblong seeds. 2. The umbellatus, with flowers growing in umbels, is a native of Jamaica; and rises from two to three feet high, sending out many branches cloathed with opposite leaves, which are terminated by small flowers in umbels.

Culture. The first is easily propagated, either by cuttings planted in the summer-months, or by seeds sown on a moderate hot-bed in the spring, but the plants require a slight shelter in winter. The second is much more tender, and therefore requires to be preserved in a stove during the winter season.

AMELOT de la Houssai (Nicholas), born at Orleans in 1634, was much esteemed at the court of France, and appointed secretary of an embassy, which that court sent to the commonwealth of Venice, as appears by the title of his translation of Father Paul's History of the Council of Trent; but he afterwards published writings which gave such offence that he was imprisoned in the Bastile. The first works he printed were the History of the Government of Venice, and that of the Uscocks, a people of Croatia. In 1683 he published his translations into French of Machiavel's Prince, and Father Paul's History of the Council of Trent, and Political Discourses of his own upon Tacitus. These performances were well received by the public. He did not prefix his own name to the two last mentioned works, but concealed himself under that of La Mothe Josseval. His translation of Father Paul was attacked by the partisans of the pope's unbounded power and authority. In France, however, it met with great success; all the advocates for the liberty of the Gallican church promoting the success of it to the utmost of their power, though at the same time there were three memorials presented

preſented to have it ſuppreſſed. When the ſecond edition of this tranſlation was publiſhed, it was violently attacked by the Abbé St Real, in a letter he wrote to Mr Bayle, dated October 17, 1685. Amelot defended himſelf, in a letter to the ſame gentleman. In 1684, he printed at Paris a French tranſlation of Baltaſar Gracian's *Oraculo manual*, with the title of *l'Homme de Cour*. In 1686, he printed *La Morale de Tacite de la flaterie*; in which work he collected ſeveral particular facts and maxims, which repreſent in a ſtrong light the artifices of court-flatterers, and the miſchievous effect of their poiſonous diſcourſes. Frederick Leonard, a bookſeller at Paris, having propoſed, in the year 1692, to print a collection of all the treaties of peace between the kings of France and all the other princes of Europe, ſince the reign of Charles VII. to the year 1690, Amelot publiſhed a ſmall volume in duodecimo, containing a preliminary diſcourſe upon theſe treatiſes; wherein he endeavours to ſhow, that moſt princes, when they enter into a treaty, think more how to evade than how to perform the terms they ſubſcribe to. He publiſhed alſo an edition of Cardinal d'Oſſat's Letters in 1697, with ſeveral obſervations of his own; which, as he tells us in his advertiſement, may ſerve as a ſupplement to the hiſtory of the reigns of Henry III. and Henry IV. kings of France. He wrote ſeveral other works; and died at Paris in 1706, being then almoſt 73 years of age.

AMELOT (Denis), a celebrated French writer, was born at Saintonge in 1606. He maintained a cloſe correſpondence with the fathers of the Oratory, a congregation of prieſts founded by Philip of Neri. He wrote the life of Charles de Gondren, ſecond ſuperior of this congregation, and publiſhed it at Paris in 1643. In this piece he ſaid ſomething of the famous Abbot of St Cyran, which greatly diſpleaſed the gentlemen of Port Royal; who, to be revenged of him, publiſhed a libel againſt him, intitled *Idée generale l'eſprit et de livre de P. Amelote*. He was ſo much provoked by this ſatire, that he did all in his power to injure them. They had finiſhed a tranſlation of the New Teſtament, and were deſirous to have it publiſhed; for which purpoſe they endeavoured to procure an approbation from the doctors of the Sorbonne, and a privilege from the king. But Amelot, by his influence with the Chancellor, prevented them from ſucceeding. In this he had alſo a view to his own intereſt; for he was about to publiſh a tranſlation of his own of the New Teſtament. Amelot's tranſlation with annotations, in 4 vols. octavo, was printed in the years 1666, 1667, and 1668. It is not very exact, according to F. Simon, who tells us that it contains ſome very groſs blunders. Amelot wrote alſo an Abridgement of Divinity, a Catechiſm for the Jubilee, and a kind of Chriſtian Manual for every Day. Towards the end of his life, he entered into the congregation of the Oratory in 1650; and continued amongſt them till his death, which happened in 1678.

AMEN, אמן, ſignifies *true, faithful, certain*. It is made uſe of likewiſe to affirm any thing, and was a ſort of affirmation uſed often by our Saviour: Αμην, Αμην λεγω υμιν. i. e. *Verily, verily, I ſay unto you.* Laſtly, it is underſtood as expreſſing a wiſh; as *Amen, So be it*, Numb. v. 22. or an affirmation, *Amen, yes, I believe it*, 1 Cor. xiv. 16. The Hebrews end the five books of Pſalms, according to their way of diſtributing them, with the words *amen, amen*; which the Septuagint have tranſlated γενοιτο, γενοιτο; and the Latins *fiat, fiat*. The Greek and Latin churches have preſerved this word in their prayers, as well as *alleluiah* and *hoſanna*; becauſe they obſerved more energy in them than in any terms which they could uſe in their own languages. At the concluſion of the public prayers, the people anſwered with a loud voice, Amen; and St Jerom ſays, that at Rome when the people anſwered Amen, the ſound of their voices was like a clap of thunder: *In ſimilitudinem cæleſtis tonitrui Amen reboat.* The Jews aſſert that the gates of Heaven are opened to him who anſwers *Amen* with all his might.

AMEND, or AMENDE, in the French cuſtoms, a pecuniary puniſhment impoſed by a judge for any crime, falſe proſecution, or groundleſs appeal.

AMENDE Honourable, an infamous kind of puniſhment inflicted in France upon traitors, parricides, or ſacrilegious perſons, in the following manner: The offender being delivered into the hands of the hangman, his ſhirt is ſtripped off, a rope put about his neck, and a taper in his hand; then he is led into court, where he muſt beg pardon of God, the king, the court, and his country. Sometimes the puniſhment ends here; but ſometimes it is only a prelude to death, or baniſhment to the galleys.

AMENDE Honourable, is a term alſo uſed for making recantation in open court, or in preſence of the perſon injured.

AMENDMENT, in a general ſenſe, denotes ſome alteration or change made in a thing for the better.

AMENDMENT, in law, the correction of an error committed in the proceſs, which may be amended after judgment, unleſs the error lies in giving judgment; for in that caſe it is not amendable, but the party muſt bring a writ of error. A bill may be amended on the file at any time before the plea is pleaded; but not afterwards, without motion and leave of the court.

AMENDMENT of a Bill, is ſome alteration made in the firſt draught of it.

AMENTUM, in botany, the name of a ſpecies of calyx, conſiſting of valves, and hanging down in different directions from the caulis. Common oats afford a good example of the amentum.

AMENTUM, in Roman antiquity, a thong tied about the middle of a javelin or dart, and faſtened to the forefinger, in order to recover the weapon as ſoon as it was diſcharged. The ancients made great uſe of the amentum, thinking it helped to enforce the blow. It alſo denotes a latchet that bound their ſandals.

AMERADE, a kind of officers among the Saracens, anſwering to the governors of provinces among the Europeans.—The name is originally the ſame with that of emir.

AMERCEMENT, or AMERCIAMENT, in law, a pecuniary puniſhment impoſed on offenders at the mercy of the court. It differs from a fine in being impoſed arbitrarily in proportion to the fault; whereas a fine is a certain puniſhment ſettled expreſsly by ſome ſtatute.

America.

AMERICA; one of the four quarters of the world, probably the largest of the whole, and from its late discovery frequently denominated the *New World*, or *New Hemisphere*.

1 Boundaries.

This vast country extends from the 80th degree of north, to the 56th degree of south, latitude; and where its breadth is known, from the 35th to the 136th degree west longitude from London; stretching between 8000 and 9000 miles in length, and in its greatest breadth 3690. It sees both hemispheres, has two summers and a double winter, and enjoys almost all the variety of climates which the earth affords. It is washed by the two great oceans. To the eastward, it has the Atlantic, which divides it from Europe and Africa; to the west it has the Pacific or Great South-Sea, by which it is separated from Asia. By these seas it may, and does, carry on a direct commerce with the other three parts of the world.

2 North and South continent.

America is not of equal breadth throughout its whole extent; but is divided into two great continents, called *North*, and *South*, *America*, by an isthmus 1500 miles long, and which, at Darien, about Lat. 9° N. is only 60 miles over. This isthmus forms, with the northern and southern continents, a vast gulph, in which lie a great number of islands, called the *West-Indies*, in contradistinction to the eastern parts of Asia, which are called the *East-Indies*.

3 Grand objects which America presents to view.

"Next to the extent of the New-World, the grandeur of the objects which it presents to view, is most apt to strike the eye of an observer. Nature seems here to have carried on her operations upon a larger scale and with a bolder hand, and to have distinguished the features of this country by a peculiar magnificence.

4 Its mountains.

The mountains of America are much superior in height to those in the other divisions of the globe. Even the plain of Quito, which may be considered as the base of the Andes, is elevated farther above the sea than the top of the Pyrenees." The most elevated point of the Andes, according to Don Ulloa, is twenty thousand, two hundred, and eighty feet, which is, at least, seven thousand, one hundred, and two feet above the Peak of Teneriffe, which is the highest known mountain in the ancient continent. (See the article ANDES.)

5 Its rivers.

From the lofty and extensive mountains of America descend rivers with which the streams of Europe, of Asia, or of Africa, are not to be compared, either for length of course, or for the vast volumes of water which they pour into the oceans. The Danube, the Indus, the Ganges, or the Nile, in the ancient Hemisphere, are not of equal magnitude with the St Laurence, the Missouri, or the Mississippi, in North-America; or with the Maragnon, the Orinoco, or the Plata, in South-America. The rivers in the latter of these American continents are like vast arms of the sea. (See the articles ST LAURENCE, MISSOURI, &c. &c.)

6 Its lakes.

"The lakes of the New-World are no less conspicuous for grandeur than its mountains and rivers. There is nothing in other parts of the globe which resembles the prodigious chain of lakes in North-America. They may be properly termed inland seas of fresh water; and even those of the second or third class of magnitude, are of a larger circuit (the Caspian sea excepted) than the greatest lake of the ancient continent." (See the articles SUPERIOR, HURON, ERIE, &c.)

7 Its excessive luxuriance of vegetation.

The luxuriance of the vegetable creation in the New-World is extremely great. In the southern provinces, where the moisture of the climate is aided by the warmth of the sun, the woods are almost impervious, and the surface of the ground is hid from the eye, under a thick covering of shrubs, of herbs, and weeds. In the northern provinces although the forests are not encumbered with the same wild luxuriance of vegetation, the trees of various species are generally more lofty, and often much larger, than are to be seen in any other parts of the world.

8 Remarkable prevalence of cold in America.

One of the most remarkable circumstances, or features, of the New-World, is the general predominance of cold, throughout the whole extent of this great continent. Though we cannot, in any country, determine the precise degree of heat merely by the distance of the equator, because the elevation above the sea, the nature of the soil, &c. all affect the climate; yet, in the Ancient Continent, the heat is much more in proportion to the vicinity to the equator than in any part of America. Here the rigour of the frigid zone extends over half that which should be temperate by its position. Even in those latitudes where the winter is scarcely felt in the Old-Continent, it reigns with great severity in America, though during a short period. Nor does this cold, prevalent in the New-World, confine itself to the temperate zones; but extends its influence to the torrid zone also, considerably mitigating the excess of its heat.—Along the eastern coast, the climate, tho' more similar to that of the torrid zone in other parts of the earth, is nevertheless considerably milder than in those countries of Asia and Africa which lie in the same latitude. From the southern tropic to the extremity of the American continent, the cold is said to be much greater than in parallel northern latitudes even of America itself.

9 Dr Robertson's reasons for this superior degree of cold. *History of America*, vol. II. p. 10. 11, 12, & 13.

For this so remarkable difference between the climate of the New-Continent and the old, various causes have been assigned by different authors. The following is the opinion of the celebrated Dr Robertson on this subject. "Though the utmost extent of America towards the north be not yet discovered, we know that it advances nearer to the pole than either Europe or Asia. The latter have large seas to the north, which are open during part of the year; and even when covered with ice, the wind that blows over them is less intensely cold than that which blows over land in the same latitudes. But, in America, the land stretches from the river St Laurence towards the pole, and spreads out immensely to the west. A chain of enormous mountains, covered with snow and ice, runs thro' all this dreary region. The wind passing over such an extent of high and frozen land, becomes so impregnated with cold, that it acquires a piercing keenness, which it retains in its progress through warmer climates; and is not entirely mitigated until it reach the gulph of Mexico. Over all the continent of North-America, a north-westerly wind and excessive cold are synonymous terms. Even in the most sultry weather, the moment that the wind veers to that quarter, its penetrating influence is felt in a transition from heat to cold no less violent than sudden. To this powerful cause we may ascribe the extraordinary dominion of cold, and its violent inroads into the southern provinces in that part of the globe.

"Other causes, no less remarkable, diminish the active


A General MAP of NORTH AMERICA from the best AUTHORITIES
ATLANTIC OCEAN
GULF of MEXICO
HUDSONS BAY
CANADA
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
WEST FLORIDA
NEW ENGLAND
NOVA SCOTIA
NEW BRITAIN
LABRADOR
NEW MEXICO
NEW ALBION
New North Wales
New South Wales
WESTERN SEA
Cumberland I.
Hudsons Straits
Davis's Inl.
Cape Florida
Chesapeak Bay
Mexico

Plate XV


SOUTH AMERICA
from the best
Authorities
ATLANTIC OCEAN
SOUTHERN OCEAN
SOUTH SEA
CARIBBEAN SEA
TERRA FIRMA
AMAZONIA
PERU
BRASIL
PARAGUAY
LA PLATA
CHILI
PATAGONIA
Pampas
New Granada
AFRICA
Equinoctial Line
Tropic of Capricorn
GALLIPAGOS ISLES
Quito
Lima
Potosi
Assumption
Buenos Ayres
River Plate
Baldivia
Chiloe
Falkland Isles
Salvador
C. St. Augustin
Cape St. Roque
St. Catharine I.
C. Horn
Cayenne I. & T.
C. Orange
North Cape
Surinam
Tupinambas
Tapayos
Paranahiwa R.
Araguaya R.
Madeira R.
Amazon
C. Blanco
Bay of Guayaquil
Bonaventura Bay
Tierra del Fuego
Falkland
States I.
Port Desiré
Port St. Julian
Valparaiso
Mountains

America.

tive power of heat in those parts of the American continent which lie between the tropics. In all that portion of the globe, the wind blows in an invariable direction from east to west. As this wind holds its course across the ancient continent, it arrives at the countries which stretch along the western shore of Africa, inflamed with all the fiery particles which it hath collected from the sultry plains of Asia, and the burning sands in the African desarts. The coast of Africa is, accordingly, the region of the earth which feels the most fervent heat, and is exposed to the unmitigated ardour of the torrid zone. But this same wind, which brings such an accession of warmth to the countries lying between the river of Senegal and Cafraria, traverses the Atlantic Ocean, before it reaches the American shore. It is cooled in its passage over this vast body of water; and is felt as a refreshing gale along the coasts of Brasil and Guiana, rendering these countries, though among the warmest in America, temperate, when compared with those which lie opposite to them in Africa. As this wind advances in its course across America, it meets with immense plains, covered with impenetrable forests; or occupied by large rivers, marshes, and stagnating waters, where it can recover no considerable degree of heat. At length it arrives at the Andes, which run from north to south through the whole continent. In passing over their elevated and frozen summits it is so thoroughly cooled, that the greater part of the countries beyond them hardly feel the ardour to which they seem exposed by their situation. In the other provinces of America, from Tierra-Fermè westward to the Mexican empire, the heat of the climate is tempered in some places, by the elevation of the land above the sea; in others, by their extraordinary humidity; and in all, by the enormous mountains scattered over this tract. The islands of America in the Torrid Zone are either small or mountainous, and are fanned alternately by refreshing sea and land breezes.

"The causes of the extraordinary cold towards the southern limits of America, and in the seas beyond it, cannot be ascertained in a manner equally satisfying. It was long supposed, that a vast continent, distinguished by the name of *Terra Australis Incognita*, lay between the southern extremity of America and the Antarctic pole. The same principles which account for the extraordinary degree of cold in the northern regions of America, were employed in order to explain that which is felt at Cape-Horn and the adjacent countries. The immense extent of the southern continent, and the large rivers which it poured into the ocean, were mentioned and admitted by philosophers as causes sufficient to occasion the unusual sensation of cold, and the still more uncommon appearances of frozen seas in that region of the globe. But the imaginary continent to which such influence was ascribed having been searched for in vain, and the space which it was supposed to occupy having been found to be an open sea; new conjectures must be formed with respect to the causes of a temperature of climate, so extremely different from that which we experience in countries removed at the same distance from the opposite pole.

Ibid. p. 424, 425. *note* VI.

"The most obvious and probable cause of the superior degree of cold towards the southern extremity of America, seems to be the form of the continent there. Its breadth gradually decreases as it stretches from St Antonia southwards, and from the bay of St Julian to the straits of Magellan its dimensions are much contracted. On the east and west sides, it is washed by the Atlantic and Pacific oceans. From its southern point, it is probable that a great extent of sea, without any considerable tract of land, reaches to the Antarctic pole. In whichever of these directions the wind blows, it is cooled before it approaches the Magellanic regions, by passing over a vast body of water; nor is the land there of such extent, that it can recover any considerable degree of heat in its progress over it. These circumstances concur in rendering the temperature of the air in this district of America, more similar to that of an insular, than to that of a continental climate; and hinder it from acquiring the same degree of summer-heat, with places in Europe and Asia, in a corresponding northern latitude. The north wind is the only one that reaches this part of America, after blowing over a great continent. But, from an attentive survey of its position, this will be found to have a tendency rather to diminish than augment the degree of heat. The southern extremity of America is properly the termination of the immense ridge of the Andes, which stretches nearly in a direct line from north to south through the whole extent of the continent. The most sultry regions in South America, Guiana, Brasil, Paraguay, and Tucuman, lie many degrees to the east of the Magellanic regions. The level country of Peru, which enjoys the tropical heats, is situated considerably to the west of them. The north wind, then, though it blows over land, does not bring to the southern extremity of America an increase of heat collected in its passage over torrid regions; but before it arrives there it must have swept along the summits of the Andes, and comes impregnated with the cold of that frozen region."

10
Extreme moisture of the American climate

Another peculiarity in the climate of America is its excessive moisture in general. In some places, indeed, on the western coast, rain is not known; but, in all other parts, the moistness of the climate is as remarkable as the cold.—The forests wherewith is it is every where covered, no doubt, partly, occasion the moisture of its climate; but the most prevalent and obvious cause is the vast quantity of water in the Atlantic and Pacific Oceans, with which America is environed on all sides. Hence, those places where the continent is narrowest are deluged with almost perpetual rains, accompanied with violent thunder and lightning, by which some of them, particularly Porto-bello, are rendered in a manner uninhabitable.

11
Malignity of climate unjustly ascribed to America.

From the coldness and the moisture of America, an extreme malignity of climate has been inferred, and asserted by M. de Pauw in his *Recherches Philosophiques sur les Americains*. Hence, according to the hypothesis of this author, the smallness and irregularity of the nobler animals, and the size and enormous multiplication of reptiles and insects.

History of Mexico, vol. II. p. 255.

But the supposed smallness and less ferocity of the American animals, the Abbé Clavigero observes, instead of the malignity, demonstrates the mildness and bounty of the clime, if we give credit to Buffon, at whose fountain M. de Pauw has drank, and of whose testimony he has availed himself against Don Pernetty. Buffon, who in many places of his Natural History produces the smallness of the American animals as a certain argument of the malignity of the climate of America; in treating afterwards of savage animals, in Tom. II. speaks thus: "As all things, even the most free creatures, are subject to natural laws, and animals as well as men are subjected to the influence of climate and soil, it appears that the same causes which have civilized and polished the human species in our climates, may have likewise produced similar effects upon other species. The wolf, which is perhaps the fiercest of all the quadrupeds of the temperate zone, is however incomparably less terrible than the tyger, the lion, and the panther of the torrid zone; and the white bear and hyena of the frigid zone. In America, where the air and the earth are more mild than those of Africa, the tyger, the lion, and the panther, are not terrible but in the name. They have degenerated, if fierceness, joined to cruelty, made their nature; or, to speak more properly, they have only suffered the influence of the climate: under a milder sky their nature also has become more mild. From climes which are immoderate in their temperature are obtained drugs, perfumes, poisons, and all those plants whose qualities are strong. The temperate earth, on the contrary, produces only things which are temperate; the mildest herbs, the most wholesome pulse, the sweetest fruits, the most quiet animals, and the most humane men, are the natives of this happy clime. As the earth makes the plants, the earth and plants make animals; the earth, the plants, and the animals make man. The physical qualities of man, and the animals which feed on other animals, depend, though more remotely, on the same causes which influence their dispositions and customs. This is the greatest proof and demonstration, that in temperate climes every things becomes temperate, and that in intemperate climes every thing is excessive; and that size and form, which appear affixed and determinate qualities, depend notwithstanding, like the relative qualities, on the influence of climate. The size of our quadrupeds cannot be compared with that of an elephant, the rhinoceros, or sea-horse. The largest of our birds are but small if compared with the ostrich, the condore, and *casuare*." So far M. Buffon, whose text we have copied, because it is contrary to what M. de Pauw writes against the climate of America, and to Buffon himself in many other places.

"If the large and fierce animals, says Clavigero, are natives of intemperate climes, and small and tranquil animals of temperate climes, as M. Buffon has here established; if mildness of climate influences the disposition and customs of animals, M. de Pauw does not well deduce the malignity of the climate of America from the smaller size and less fierceness of its animals; he ought rather to have deduced the gentleness and sweetness of its climate from this antecedent. If, on the contrary, the smaller size and less fierceness of the American animals, with respect to those of the old continent, are a proof of their degeneracy, arising from the malignity of the clime, as M. de Pauw would have it, we ought in like manner to argue the malignity of the climate of Europe from the smaller size and less fierceness of its animals, compared with those of Africa. If a philosopher of the country of Guinea should undertake a work in imitation of M. de Pauw, with this title, *Recherches Philosophiques sur les Europeens*, he might avail himself of the same argument which M. de Pauw uses, to demonstrate the malignity of the climate of Europe, and the advantages of that of Africa. The climate of Europe he would say, is very unfavourable to the production of quadrupeds, which are found incomparably smaller, and more cowardly than ours. What are the horse and the ox, the largest of its animals, compared with our elephants, our rhinoceroses, our sea-horses, and our camels? What are its lizards, either in size or intrepidity, compared with our crocodiles? Its wolves, its bears, the most dreadful of its wild beasts, when beside our lions and tigers? Its eagles, its vultures, and cranes, if compared with our ostriches, appear only like hens.

8 America not more infested than other countries with insects and noxious animals.

As to the enormous size and prodigious multiplication of the insects and other little noxious animals, "The surface of the earth (says M. de Pauw), infected by putrefaction, was over-run with lizards, serpents, reptiles, and insects monstrous for size, and the activity of their poison, which they drew from the copious juices of this uncultivated soil, that was corrupted and abandoned to itself, where the nutritive juice became sharp, like the milk in the breast of animals which do not exercise the virtue of propagation. Caterpillars, crabs, butterflies, beetles, spiders, frogs, and toads, were for the most part of an enormous corpulence in their species, and multiplied beyond what can be imagined. Panama is infested with serpents, Carthagena with clouds of enormous bats, Porto-bello with toads, Surinam with *kakerlacas* or *cucarachas*, Gaudaloupe, and the other colonies of the islands, with beetles, Quito with niguas or chegoes, and Lima with lice and bugs. The ancient kings of Mexico, and the emperors of Peru, found no other means of ridding their subjects of those insects which fed upon them, than the imposition of an annual tribute of a certain quantity of lice. Ferdinand Cortes found bags full of them in the palace of Montezuma." But this argument, exaggerated as it is, proves nothing against the climate of America in general, much less against that of Mexico. There being some lands in America, in which, on account of their heat, their humidity, or want of inhabitants, large insects are found, and excessively multiplied, will prove at most, that in some places the surface of the earth is infected, as he says, with putrefaction; but not that the soil of Mexico, or that of all America, is stinking, uncultivated, vitiated, and abandoned to itself. If such a deduction were just, M. de Pauw might also say, that the soil of the old continent is barren and fetid; as in many countries of it there are prodigious multitudes of monstrous insects, noxious reptiles, and vile animals, as in the Philippine Isles, in many of those of the Indian archipelago, in several countries of the south of Asia, in many of Africa, and even in some of Europe. The Philippine Isles are infested with enormous ants and monstrous butterflies; Japan with scorpions; South of Asia and Africa with serpents; Egypt with asps; Guinea and Ethiopia with armies of ants; Holland with field-rats; Ukrania with toads, as M. de Pauw himself affirms. In Italy, the Campagna di Roma (although peopled for so many ages), is infested with vipers; Calabria with tarantulas; the shores of the Adriatic sea with clouds of gnats; and even in France, the population of which is so great and so ancient, whose lands are so well cultivated, and whose climate is so celebrated by the French, there appeared,

America.

peared, a few years ago, according to M. Buffon, a new ſpecies of field-mice, larger than the common kind, called by him *Surmulots*, which have multiplied exceedingly, to the great damage of the fields. M. Bazin, in his Compendium of the Hiſtory of Inſects, numbers 77 ſpecies of bugs, which are all found in Paris and in its neighbourhood. That large capital, as Mr Bomare ſays, ſwarms with thoſe diſguſtful inſects. It is true that there are places in America, where the multitude of inſects, and filthy vermin, make life irkſome; but we do not know that they have arrived to ſuch exceſs of multiplication as to depopulate any place, at leaſt there cannot be ſo many examples produced of this cauſe of depopulation in the new as in the old continent, which are atteſted by Theophraſtus, Varro, Pliny, and other authors. The frogs depopulated one place in Gaul, and the locuſts another in Africa. One of the Cyclades was depopulated by mice; Amiclas, near to Taracina, by ſerpents; another place, near to Ethiopia, by ſcorpions and poiſonous ants; and another by ſcolopendras; and not ſo diſtant from our own times, the Mauritius was going to have been abandoned on account of the extraordinary multiplication of rats, as we can remember to have read in a Fench author.

With reſpect to the ſize of the inſects, reptiles, and ſuch animals, M. de Pauw makes uſe of the teſtimony of M. Dumont, who, in his Memoirs on Louiſiana, ſays, that the frogs are ſo large there that they weigh 37 French pounds, and that their horrid croaking imitates the bellowing of cows. But M. de Pauw himſelf ſays (in his anſwer to Don Pernetty, cap. 17.), that all thoſe who have written about Louiſiana from Henepin, Le Clerc, and Tonti, to Dumont, have contradicted each other, ſometimes on one and ſometimes on another ſubject. In fact, neither in the old or the new continent are there frogs of 37 pounds in weight (ſee the article RANA); but there are in Aſia and in Africa ſerpents, butterflies, ants, and other animals of ſuch monſtrous ſize, that they exceed all thoſe which have been diſcovered in the New-World. We know very well, that an American hiſtorian ſays, that a certain gigantic ſpecies of ſerpents is to be found in the woods, which attract men with their breath, and ſwallow them up; but we know alſo that ſeveral hiſtorians, both ancient and modern, report the ſame extravagant and incredible thing of the ſerpents of Aſia, and even ſomething more. Megaſthenes, cited by Pliny, ſaid, that there were ſerpents found in Aſia, ſo large, that they ſwallowed entire ſtags and bulls. Metrodorus, cited by the ſame author, affirms, that in Aſia there were ſerpents which, by their breath, attracted birds, however high they were or quick their flight. Among the moderns, Gemelli, in Vol. V. of his *Giro del Mundo*, when he treats of the animals of the Philipine iſles, ſpeaks thus: "There are ſerpents in theſe iſlands of immoderate ſize; there is one called *Ibintin*, very long, which ſuſpending itſelf by the tail from the trunk of a tree, waits till ſtags, bears, and alſo men paſs by, in order to attract them with its breath, and devour them at once entirely:" from whence it is evident, that this very ancient fable has been common to both continents.

Further, it may be aſked, In what country of America could M. de Pauw find ants to equal thoſe of the Philippine-iſlands called *Sulum*, reſpecting which Hernandez affirms, that they are ſix fingers broad in length and one in breadth? Who has ever ſeen in America butterflies ſo large as thoſe of Bourbon, Ternate, the Philippine-iſles, and all the Indian-archipelago? The largeſt bat of America (native to hot ſhady countries), which is that called by Buffon *Vampiro*, is, according to him of the ſize of a pigeon. *La Rougette*, one of the ſpecies of Aſia, is as large as a raven; and the *Rouſette*, another ſpecies of Aſia, is as big as a large hen. Its wings, when extended, meaſure from tip to tip three Pariſian feet, and according to Gemelli, who meaſured it in the Philippine-iſles, ſix palms. M. Buffon acknowledges the exceſs in ſize of the Aſiatic bat over the American ſpecies, but denies it as to number. Gemelli ſays, that thoſe of the iſland of Luzon were ſo numerous that they darkened the air, and that the noiſe which they made with their teeth, in eating the fruits of the woods, was heard at the diſtance of two miles. M. de Pauw ſays, in talking of ſerpents, "it cannot be affirmed that the new world has ſhown any ſerpents larger than thoſe which Mr Adanſon ſaw in the deſerts of Africa." The greateſt ſerpent found in Mexico, after a diligent ſearch made by Hernandez, was 18 feet long: but this is not to be compared with that of the Moluccas, which Bomare ſays is 33 feet in length; nor with the *Anacandaja* of Ceylon, which the ſame author ſays is more than 33 feet long; nor with others of Aſia and Africa, mentioned by the ſame author. Laſtly, the argument drawn from the multitude and ſize of the American inſects is fully as weighty as the argument drawn from the ſmallneſs and ſcarcity of quadrupeds, and both detect the ſame ignorance, or rather the ſame voluntary and ſtudied forgetfulneſs, of the things of the old continent.

With reſpect to what M. de Pauw, has ſaid of the tribute of lice in Mexico, in that as well as many other things he diſcovers his ridiculous credulity. It is true that Cortes found bags of lice in the magazines of the palace of king Axajacatl. It is alſo true, that Montezuma impoſed ſuch a tribute, not on all his ſubjects however, but only on thoſe who were beggars; not on account of the extraordinary multitude of thoſe inſects, as M. de Pauw affirms, but becauſe Montezuma, who could not ſuffer idleneſs in his ſubjects, reſolved that that miſerable ſet of people, who could not labour, ſhould at leaſt be occupied in louſing themſelves. This was the true reaſon of ſuch an extraordinary tribute, as Torquemada, Betancourt, and other early hiſtorians relate; and nobody ever before thought of that which M. de Pauw affirms, merely becauſe it ſuited his prepoſterous ſyſtem. Thoſe diſguſting inſects poſſibly abound as much in the hair and cloaths of American beggars, as of any poor and uncleanly low people in the world: but there is not a doubt, that if any ſovereign of Europe was to exact ſuch a tribute from the poor in his dominions, not only bags, but great veſſels might be filled with them.

9 General deſcription of the natives.

It is now time to turn our attention to the *Aborigines*, or natives, of the New-World. At the time when this great continent was made more generally known to the Europeans by the diſcoveries of Chriſtopher Columbus, and of the illuſtrious navigators who imbibed the ſpirit and enthuſiaſm of that great man, it was found inhabited by various tribes and nations of men, who differed, in many reſpects, from moſt of the people in the three

America.

three other quarters of the world. In their phyſical hiſtory, however, the greateſt peculiarity in the Americans is their complexion, and the little difference which is obſerved, in this reſpect, throughout the whole extent of the American continent. In Europe, and in Aſia, the people who inhabit the northern countries are of a fairer complexion than thoſe who dwell more to the ſouthward. In the torrid zone, both in Africa and Aſia, the natives are entirely black, or the next thing to it. This, however, muſt be underſtood with ſome limitation. The people of Lapland, who inhabit the moſt northerly part of Europe, are by no means ſo fair as the inhabitants of Britain; nor are the Tartars ſo fair as the inhabitants of Europe, who lie under the ſame parallels of latitude. Nevertheleſs, a Laplander is fair when compared with an Abyſſinian, and a Tartar if compared with a native of the Molucca iſlands.—In America, this diſtinction of colour was not ſo diſtinctly, and ſo prominently, marked. In the torrid zone there were no negroes, and in the temperate and frigid zones there were no white people. Moſt of them were of a kind of red copper-colour, which Mr Forſter obſerved, in the Peſſerais of Tierra del Fuego, to have ſomething of a gloſs reſembling that metal. It does not appear, however, that this matter has, hitherto been inquired into with ſufficient accuracy. The inhabitants of the inland parts of South America, where that continent is wideſt, and conſequently the influence of the ſun moſt powerful, have never been accurately compared with thoſe of Canada, or more northerly parts, at leaſt as far as we know. Yet this ought to have been done, and that in many inſtances too, before it could be aſſerted ſo poſitively as moſt authors do, that *there is not the leaſt difference of complexion among the natives of America.* Indeed, ſo many ſyſtems have been formed concerning theſe ſingular people, that it is very difficult to obtain a true knowledge of the moſt ſimple facts, even from the beſt and moſt unprejudiced writers.—If we may believe the Abbé Raynal the Californians are ſwarthier than the Mexicans; and ſo poſitive is he in this opinion, that he gives a reaſon for it. "This difference of colour," ſays he, "proves, that the civilized life of ſociety ſubverts, or totally changes, the order and laws of nature, ſince we find, under the temperate zone, a ſavage people that are blacker than the civilized nations of the torrid zone."—On the other hand, Dr Robertſon claſſes all the inhabitants of Spaniſh America together with regard to colour, whether they are civilized or uncivilized; and when he ſpeaks of California, takes no notice of any peculiarity in their colour more than others.—The general appearance of the indigenous Americans in various diſtricts is thus deſcribed by the chevalier Pinto: "They are all of a copper colour, with ſome diverſity of ſhade, not in proportion to their diſtance from the Equator, but according to the degree of elevation of the territory in which they reſide. Thoſe who live in a high country are fairer than thoſe in the marſhy low lands on the coaſt. Their face is round; farther removed, perhaps, than that of any people, from an oval ſhape. Their fore-head is ſmall; the extremity of their ears far from the face; their lips thick; their noſe flat; their eyes black, or of a cheſnut colour, ſmall, but capable of diſcerning objects at a great diſtance. Their hair is always thick and ſleek, and without any tendency to curl. At the firſt aſpect, a South-American appears to be mild and innocent; but, on a more attentive view, one diſcovers in his countenance ſomething wild, diſtruſtful, and ſullen."

14 Don Ulloa's account.

The following account of the native Americans is given by Don Antonio Ulloa, in his late work entitled *Memoires philoſophiques, hiſtoriques, et phyſiques, concernant la decouverte de l'Amerique.*

The American Indians are naturally of a colour bordering upon red. Their frequent expoſure to the ſun and wind changes it to their ordinary duſky hue. The temperature of the air appears to have little or no influence in this reſpect. There is no perceptible difference in complexion between the inhabitants of the high and thoſe of the low parts of Peru; yet the climates are of an extreme difference. Nay, the Indians who live as far as 40 degrees and upwards ſouth or north of the equator, are not to be diſtinguiſhed, in point of colour, from thoſe immediately under it.

There is alſo a general conformation of features and perſon, which, more or leſs, characterizeth them all. Their chief diſtinctions in theſe reſpects are a ſmall forehead, partly covered with hair to the eye-brows, little eyes, the noſe thin, pointed, and bent towards the upper lip; a broad face, large ears, black, thick, and lank hair; the legs well formed, the feet ſmall, the body thick and muſcular; little or no beard on the face, and that little never extending beyond a ſmall part of the chin and upper lip. It may eaſily be ſuppoſed that this general deſcription cannot apply, in all its parts, to every individual; but all of them partake ſo much of it, that they may be eaſily diſtinguiſhed even from the mulattoes, who come neareſt to them in point of colour.

The reſemblance among all the American tribes is not leſs remarkable in reſpect to their genius, character, manners, and particular cuſtoms. The moſt diſtant tribes are, in theſe reſpects, as ſimilar as though they formed but one nation.

All the Indian nations have a peculiar pleaſure in painting their bodies of a red colour, with a certain ſpecies of earth. The mine of Guancavelica was formerly of no other uſe than to ſupply them with this material for dyeing their bodies; and the cinnabar extracted from it was applied entirely to this purpoſe. The tribes in Louiſiana and Canada have the ſame paſſion; hence minium is the commodity moſt in demand there.

It may, perhaps, ſeem ſingular that theſe nations, whoſe natural colour is red, ſhould affect the ſame colour as an artificial ornament. But it may be obſerved, that they do nothing in this reſpect but what correſponds to the practice of Europeans, who alſo ſtudy to heighten and diſplay to advantage the natural red and white of their complexions. The Indians of Peru have now indeed abandoned the cuſtom of painting their bodies: but it was common among them before they were conquered by the Spaniards; and it ſtill remains the cuſtom of all thoſe tribes who have preſerved their liberty. The northern nations of America, beſides the red colour which is predominant, employ alſo black, white, blue, and green, in painting their bodies.

11 Peculiarities in regard to ornament and dreſs.

The adjuſtment of theſe colours is a matter of as great conſideration with the Indians of Louiſiana and the

America. the vaſt regions extending to the north, as the ornaments of dreſs among the moſt poliſhed nations. The buſineſs itſelf they call *Mactaher*, and they do not fail to apply all their talents and aſſiduity to accompliſh it in the moſt finiſhed manner. No lady of the greateſt faſhion ever conſulted her mirror with more anxiety, than the Indians do while painting their bodies. The colours are applied with the utmoſt accuracy and addreſs. Upon the eye-lids, preciſely at the root of the eye-laſhes, they draw two lines as fine as the ſmalleſt thread; the ſame upon the lips, the openings of the noſtrils, the eye-brows, and the ears; of which laſt they even follow all the inflexions and ſinuoſities. As to the reſt of the face, they diſtribute various figures, in all which the red predominates, and the other colours are aſſorted ſo as to throw it out to the beſt advantage. The neck alſo receives its proper ornaments; a thick coat of vermilion commonly diſtinguiſhes the cheeks. Five or ſix hours are requiſite for accompliſhing all this with the nicety which they affect. As their firſt attempts do not always ſucceed to their wiſh, they efface them, and begin a-new upon a better plan. No coquette is more faſtidious in her choice of ornament, none more vain when the important adjuſtment is finiſhed. Their delight and ſelf-ſatisfaction are then ſo great, that the mirror is hardly ever laid down. An Indian, *Mactahed*, to his mind, is the vaineſt of all the human ſpecies. The other parts of the body are left in their natural ſtate, and, excepting what is called a *cachecul*, they go entirely naked.

Such of them as have made themſelves eminent for bravery, or other qualifications, are diſtinguiſhed by figures painted on their bodies. They introduce the colours by making punctures on their ſkin, and the extent of ſurface which this ornament covers is proportioned to the exploits they have performed. Some paint only their arms, others both their arms and legs; others again their thighs, while thoſe who have attained the ſummit of warlike renown, have their bodies painted from the waiſt upwards. This is the heraldry of the Indians; the devices of which are probably more exactly adjuſted to the merits of the perſons who bear them, than thoſe of more civilized countries.

Beſides theſe ornaments, the warriors alſo carry plumes of feathers on their heads, their arms, and ancles. Theſe likewiſe are tokens of valour, and none but ſuch as have been thus diſtinguiſhed may wear them.

The propenſity to indolence is equal among all the tribes of Indians, civilized or ſavage. The only employment of thoſe who have preſerved their independence is hunting and fiſhing. In ſome diſtricts the women exerciſe a little agriculture, in raiſing Indian corn and pompions, of which they form a ſpecies of aliment, by bruiſing them together: they alſo prepare the ordinary beverage in uſe among them, taking care, at the ſame time, of the children, of whom the fathers take no charge

The female Indians of all the conquered regions of South America practice what is called the *urcu* (a word which among them ſignifies *elevation*). It conſiſts in throwing forward the hair from the crown of the head upon the brow, and cutting it round from the ears to above the eye; ſo that the forehead and eye-brows are entirely covered. The ſame cuſtom takes place in the Northern countries. The female inhabitants of both regions tie the reſt of their hair behind, ſo exactly in the ſame faſhion, that it might be ſuppoſed the effect of mutual imitation. This however being impoſſible, from the vaſt diſtance that ſeparates them, is thought to countenance the ſuppoſition of the whole of America being originally planted with one race of people. America.

This cuſtom does not take place among the males. Thoſe of the higher parts of Peru wear long and flowing hair, which they reckon a great ornament. In the lower parts of the ſame country they cut it ſhort, on account of the heat of the climate; a circumſtance in which they imitate the Spaniards. The inhabitants of Louiſiana pluck out their hair by the root, from the crown of the head forwards, in order to obtain a large forehead, otherwiſe denied them by nature. The reſt of their hair they cut as ſhort as poſſible, to prevent their enemies from ſeizing them by it in battle, and alſo to prevent them from eaſily getting their ſcalp, ſhould they fall into their hands as priſoners. 16

Remarkable inſenſibility to pain.

According to Don Ulloa, the whole race of the American Indians is diſtinguiſhed by an uncommon thickneſs of ſkin, and by an hardneſs of their fibres; circumſtances theſe, which in the opinion of this learned Spaniſh writer, contribute to that inſenſibility to bodily pain for which theſe ſingular people are ſo remarkable. Our author adduces an inſtance in ſupport of this inſenſibility, in the Americans, in the caſe of an Indian who was under the neceſſity of ſubmitting to be cut for the ſtone. This operation, it is well known, ſeldom laſts above four or five minutes. Unfavourable circumſtances, in his caſe, prolonged it to the uncommon period of 27 minutes. Yet, all this time, the patient gave no tokens of the extreme pain, commonly attending this operation: he complained only as a perſon does who feels ſome ſlight uneaſineſs. At laſt the ſtone was extracted. Two days after he expreſſed a deſire for food, and on the eighth day from the operation he quitted his bed, free from pain, although the wound was not yet thoroughly cloſed. The ſame want of ſenſibility, he ſays, is obſerved in caſes of fractures, wounds, and other accidents of a ſimilar nature. In all theſe caſes their cure is eaſily effected, and they ſeem to ſuffer leſs preſent pain than any other race of men. The ſkulls which have been taken up in their ancient burying-grounds are of a greater thickneſs than that compages of bones is commonly found to be; being from ſix to ſeven lines from the outer to the inner ſuperficies. 17

And to the inclemencies of weather.

It is natural to infer from hence, ſays Ulloa, that their comparative inſenſibility to pain is owing to a coarſer and ſtronger organization, than that of other nations. The eaſe with which they endure the ſeverities of climate is, he thinks, another proof of this. The inhabitants of the higher parts of Peru live amidſt perpetual froſt and ſnow. Although their clothing is very ſlight, they ſupport this inclement temperature, without the leaſt inconvenience. Habit, it is to be confeſſed, may contribute a good deal to this, but much alſo is to be aſcribed to the compact texture of their ſkin, which defends them from the impreſſion of cold through their pores. We muſt confeſs, however, notwithſtanding the aſſertions and conjectures of an author ſo reſpectable as Don Ulloa, that we are not very confident, that either the ſkins, or the ſkulls of the Americans are thicker than the ſkins and ſkulls of many other nations of mankind. But we do not wiſh, in this place, to

America.

to expatiate on this subject, which can only be reduced to certainty by the investigations of the anatomist, or naturalist.

The northern Indians resemble them in this respect. The utmost rigours of the winter season do not prevent them from following the chace almost naked. It is true, they wear a kind of woolen cloak, or sometimes the skin of a wild beast, upon their shoulders; but besides that it covers only a small part of their body, it would appear that they use it rather for ornament than warmth. In fact, they wear it indiscriminately, in the severities of winter and in the sultriest heats of summer, when neither Europeans nor Negroes can suffer any but the slightest cloathing. They even frequently throw aside this cloak when they go a-hunting, that it may not embarrass them in traversing their forests, where they say the thorns and undergrowth would take hold of it; while, on the contrary, they slide smoothly over the surface of their naked bodies. At all times they go with their heads uncovered, without suffering the least inconvenience, either from the cold, or from those *coups de soleil*, which in Louisiana are so often fatal to the inhabitants of other climates.

The Indians of South America distinguish themselves by modern dresses, in which they affect various tastes. Those of the high country, and of the valleys in Peru, dress partly in the Spanish fashion. Instead of hats they wear bonnets of coarse double cloth, the weight of which neither seems to incommode them when they go to warmer climates, nor does the accidental want of them seem to be felt in situations where the most piercing cold reigns. Their legs and feet are always bare, if we except a sort of sandals made of the skins of oxen. The inhabitants of South America, compared with those of North America, are described as generally more feeble in their frame; less vigorous in the efforts of their mind; of gentler dispositions more addicted to pleasure, and sunk in indolence.—This, however, is not universally the case. Many of

18 Terrible trials undergone by their chiefs.

their nations are as intrepid and enterprising as any others on the whole continent. Among the tribes on the banks of the Oronooko, if a warrior aspires to the post of captain, his probation begins with a long fast, more rigid than any ever observed by the most abstemious hermit. At the close of this the chiefs assemble; and each gives him three lashes with a large whip, applied so vigorously, that his body is almost flayed. If he betrays the least symptom of impatience, or even of sensibility, he is disgraced forever, and is rejected as unworthy of the honour. After some interval, his constancy is proved by a more excruciating trial. He is laid in his hammock with his hands bound fast; and an innumerable multitude of venomous ants, whose bite occasions a violent pain and inflammation, are thrown upon him. The judges of his merit stand around the hammock; and whilst these cruel insects fasten upon the most sensible parts of his body, a sigh, a groan, or an involuntary motion expressive of what he suffers, would exclude him from the dignity of which he is ambitious. Even after this evidence, his fortitude is not deemed to be sufficiently ascertained, till he has stood another test more severe, if possible, than the former. He is again suspended in his hammock, and covered with the leaves of the palmetto. A fire of stinking herbs is kindled underneath, so as he may feel its heat, and be involved in smoke. Though scorched and almost suffocated, he must continue to endure this with the same patient insensibility. Many perish in this essay of their firmness and courage; but such as go through it with applause, receive the ensigns of their new dignity with much solemnity, and are ever after regarded as leaders of approved resolution, whose behaviour, in the most trying situations, will do honour to their country. In North America the previous trial of a warrior is neither so formal nor so severe: Though, even there, before a youth is permitted to bear arms, his patience and fortitude are proved by blows, by fire, and by insults, more intolerable to a haughty spirit than either.

19 Customs and dispositions of the North-Americans, more particularly.

Of the manners and customs of the North Americans more particularly, the following is the most consistent account that can be collected from the best informed and most impartial writers.

When the Europeans first arrived in America, they found the Indians quite naked, except those parts which even the most uncultivated people usually conceal. Since that time, however, they generally use a coarse blanket, which they buy of the neighbouring planters.

Their huts or cabbins are made of stakes of wood driven into the ground, and covered with branches of trees or reeds. They lie on the floor either on mats or the skins of wild-beasts. Their dishes are of timber, but their spoons are made of the skulls of wild oxen; and their knives of flint. A kettle and a large plate constitute almost the whole utensils of the family. Their diet consists chiefly in what they procure by hunting; and sagamite, or pottage, is likewise one of their most common kinds of food. The most honourable furniture amongst them is a collection of the scalps of their enemies; with those they ornament their huts, which are esteemed in proportion to the number of this sort of spoils.

The character of the Indians is altogether founded upon their circumstances and way of life. A people who are constantly employed in procuring the means of a precarious subsistence, who live by hunting the wild animals, and who are generally engaged in war with their neighbours, cannot be supposed to enjoy much gaiety of temper, or a high flow of spirits. The Indians therefore are in general grave even to sadness; they have nothing of that giddy vivacity peculiar to some nations of Europe, and they despise it. Their behaviour to those about them is regular, modest, and respectful. Ignorant of the arts of amusement, of which that of saying trifles agreeably is one of the most considerable, they seldom speak but when they have something important to observe; and all their actions, words, and even looks, are attended with some meaning. This is extremely natural to men who are almost continually engaged in pursuits, which to them are of the highest importance. Their subsistence depends entirely on what they procure with their hands; and their lives, their honour, and every thing dear to them, may be lost by the smallest inattention to the designs of their enemies. As they have no particular object to attach them to one place rather than another, they go wherever they expect to find the necessaries of life in greatest abundance. Cities, which are the effects of agriculture and arts, they have none. The different tribes

20 Their remarkable pensiveness and taciturnity.

America. tribes or nations, are, for the ſame reaſon, extremely ſmall, when compared with civilized ſocieties, in which induſtry, arts, agriculture, and commerce, have united a vaſt number of individuals, whom a complicated luxury renders uſeful to one another. Theſe ſmall tribes live at an immenſe diſtance; they are ſeparated by a deſert frontier, and hid in the boſom of impenetrable and almoſt boundleſs foreſts.

21 Form of government among them. There is eſtabliſhed in each ſociety a certain ſpecies of government, which prevails over the whole continent of America, with exceeding little variation; becauſe over the whole of this continent the manners and way of life are nearly ſimilar and uniform. Without arts, riches, or luxury, the great inſtruments of ſubjection in poliſhed ſocieties, an American has no method by which he can render himſelf conſiderable among his companions, but by ſuperiority in perſonal qualities of body or mind. But, as nature has not been very laviſh in her perſonal diſtinctions, where all enjoy the ſame education, all are pretty much upon an equality, and will deſire to remain ſo. Liberty, therefore, is the prevailing paſſion of the Americans; and their government, under the influence of this ſentiment, is, perhaps, better ſecured than by the wiſeſt political regulations. They are very far, however, from deſpiſing all ſort of authority; they are attentive to the voice of wiſdom, which experience has conferred on the aged, and they enliſt under the banners of the chief in whoſe valour and military addreſs they have learned to repoſe a juſt and merited confidence. In every ſociety, therefore, there is to be conſidered the power of the chiefs and of the elders. Among theſe tribes which are moſt engaged in war, the power of the chief is, naturally, predominant; becauſe the idea of having a military leader was the firſt ſource of his ſuperiority, and the continual exigencies of the ſtate requiring ſuch a leader, will continue to ſupport, and even to enhance it. His power, however, is rather perſuaſive than coercive; he is reverenced as a father, rather than feared as a monarch. He has no guards, no priſons, no officers of juſtice, and one act of ill-judged violence would pull him from his humble throne. The elders in the other form of government which may be conſidered as a *mild* and *nominal* ariſtocracy, have no more power. In moſt countries, therefore, age alone is ſufficient for acquiring reſpect, influence, and authority. It is age which teaches experience, and experience is the only ſource of knowledge among a barbarous people. Among thoſe perſons buſineſs is conducted with the utmoſt ſimplicity, and which may recal to thoſe who are

22 Their public aſſemblies. acquainted with antiquity, a picture of the moſt early ages. The heads of families meet together in a houſe or cabin appointed for the purpoſe. Here the buſineſs is diſcuſſed; and here thoſe of the nation, diſtinguiſhed for their eloquence or wiſdom, have an opportunity of diſplaying thoſe talents. Their orators, like thoſe of Homer, expreſs themſelves in a bold figurative ſtyle, ſtronger than refined, or rather ſoftened, nations can well bear, and with geſtures equally violent, but often extremely natural and expreſſive. When the buſineſs is over, and they happen to be well provided with food, they appoint a feaſt upon the occaſion, of which almoſt the whole nation partakes. The feaſt is accompanied with a ſong, in which the real or fabulous exploits of their forefathers are celebrated. They have dances too, though, like thoſe of the Greeks and Romans, they are chiefly of the military kind; and their muſic and dancing accompany every feaſt.

23 Wampum or belts. To aſſiſt their memory, they have belts of ſmall ſhells, or beads, of different colours, each repreſenting a particular object, which is marked by their colour and arrangement. At the concluſion of every ſubject on which they diſcourſe, when they treat with a foreign ſtate, they deliver one of thoſe belts; for if this ceremony ſhould be omitted, all that they have ſaid paſſes for nothing. Thoſe belts are carefully depoſited in each town, as the public records of the nation; and to them they occaſionally have recourſe, when any public conteſt happens with a neighbouring tribe. Of late, as the materials of which thoſe belts are made, have become ſcarce, they often give ſome ſkin in place of the wampum (the name of the beads), and receive in return preſents of a more valuable kind from the commiſſioners; for they never conſider a treaty as of any weight, unleſs every article in it be ratified by ſuch a gratification.

It often happens, that thoſe different tribes or nations, ſcattered as they are, at an immenſe diſtance from one another, meet in their excurſions after prey. If there ſubſiſts no animoſity between them, which ſeldom is the caſe, they behave in the moſt friendly and courteous manner; but if they happen to be in a ſtate of war, or if there has been no previous intercourſe between them, all who are not friends are deemed enemies, and they fight with the moſt ſavage fury.

24 Their wars. If we except hunting and fiſhing, war is the principal employment of the Indian men: almoſt every other concern, but in particular the little agriculture which they enjoy, is conſigned to the women. The moſt common motive of the Americans for entering into war, when it does not ariſe from an accidental rencounter, or interference, is either to revenge themſelves for the death of ſome loſt friends, or to acquire priſoners, who may aſſiſt them in their hunting, and whom they adopt into their ſociety. Theſe wars are either undertaken by ſome private adventurers, or at the inſtance of the whole community. In the latter caſe, all the young men who are diſpoſed to go out to battle (for no one is compelled contrary to his inclination), give a bit of wood to the chief, as a token of their deſign to accompany him; for every thing among theſe people is tranſacted with a great deal of ceremony and with many

25 Ceremonies before ſetting out. forms. The chief who is to conduct them faſts ſeveral days, during which he converſes with no one, and is particularly careful to obſerve his dreams; which the preſumption natural to ſavages generally renders as favourable as he could deſire. A variety of other ſuperſtitions and ceremonies are obſerved. One of the moſt hideous is ſetting the war-kettle on the fire, as an emblem that they are going out to devour their enemies; which, among theſe nations, it is probable, was formerly the caſe, ſince they ſtill continue to expreſs it in clear terms, and uſe an emblem ſignificant of the ancient uſage. Then they diſpatch a porcelane, or large ſhell, to their allies, inviting them to come along, and drink the blood of their enemies. For with the Americans, as with the Greeks of old,

"A generous friendſhip no cold medium knows;
"But with one love, with one reſentment, glows."

America.

They think that those in their alliance must not only adopt their enmities, but that they must also have their resentment wound up to the same pitch with themselves. And, indeed, no people carry their friendships or their resentments so far as they do; and this is what should be expected from their peculiar circumstances: that principle in human nature which is the spring of the social affections, acts with so much the greater force the more it is restrained. The Americans, who live in small societies, who see few objects and few persons, become wonderfully attached to those objects and persons, and cannot be deprived of them without feeling themselves miserable. Their ideas are too confined to enable them to entertain just sentiments of humanity, or universal benevolence. But this very circumstance, while it makes them cruel and savage to an incredible degree, towards those with whom they are at war, adds a new force to their particular friendships, and to the common tie which unites the members of the same tribe, or of those different tribes which are in alliance with one another. Without attending to this reflection, some facts we are going to relate would excite our wonder without informing our reason, and we would be bewildered in a number of particulars, seemingly opposite to one another, without being sensible of the general cause from which they proceed.

Having finished all the ceremonies previous to the war, and the day appointed for their setting out on the expedition being arrrived, they take leave of their friends, and exchange their clothes, or whatever moveables they have, in token of mutual friendship; after which they proceed from the town, their wives and female relations walking before, and attending them to some distance. The warriors march all dressed in their finest apparel and most showy ornaments, without any order. The chief walks slowly before them, singing the war-song, while the rest observe the most profound silence. When they come up to their women, they deliver them all their finery, and putting on their worst clothes, proceed on their expedition.

26 Ensigns.

Every nation has its peculiar ensign or standard, which is generally a representation of some beast, bird, or fish. Those among the Five Nations are the bear, otter, wolf, tortoise, and eagle; and by those names the tribes are usually distinguished. They have the figures of those animals pricked and painted on several parts of their bodies; and when they march through the woods, they commonly, at every encampment, cut the representation of their ensign on trees, especially after a successful campaign: marking at the same time the number of scalps or prisoners they have taken. Their military dress is extremely singular. They cut off or pull out all their hair, except a spot about the breadth of two English crown-pieces, near the top of their heads, and entirely destroy their eye-brows. The lock left upon their heads is divided into several parcels, each of which is stiffened and adorned with wampum, beads, and feathers of various kinds, the whole being twisted into a form much resembling the modern pompoon. Their heads are painted red down to the eye-brows, and sprinkled over with white down. The gristles of their ears are split almost quite round, and distended with wires or splinters, so as to meet and tie together on the nape of the neck. These are, also, hung with ornaments, and, generally, bear the representation of some bird, or beast. Their noses are likewise bored and hung with trinkets of beads, and their faces painted, with various colours, so as to make an awful appearance. Their breasts are adorned with a gorget, or medal, of brass, copper, or some other metal; and that dreadful weapon the scalping-knife hangs by a string from the neck.

27 Military habits.

28 Quickness of their senses.

The great qualities of an Indian war are vigilance and attention, to give and avoid a surprise; and, indeed, in these they are superior to all nations in the world. Accustomed to continual wandering in the forests; having their perceptions sharpened by keen necessity, and living, in every respect, according to nature, their external senses have a degree of acutness which, at first view, appears incredible. They can trace out their enemies, at an immense distance, by the smoke of their fires, which they smell, and by the tracks of their feet upon the ground, imperceptible to an European eye, but which they can count and distinguish with the utmost facility. It is said, they can even distinguish the different nations with whom they are acquainted, and can determine the precise time when they passed, where an European could not, with all his glasses, distinguish footsteps at all. These circumstances, however, are of less importance, because their savage enemies are equally well acquainted with them. When they go out, therefore, they take care to avoid making use of any thing by which they might run the danger of a discovery. They light no fire to warm themselves, or to prepare their victuals: they lie close to the ground all day, and travel only in the night; and marching along in files, he that closes the rear diligently covers with leaves the tracts of his own feet and of theirs who preceded him. When they halt to refresh themselves, scouts are sent out to reconnoitre the country and beat up every place where they suspect an enemy to lie concealed. In this manner they enter unawares the villages of their foes; and while the flower of the nation are engaged in hunting, massacre all the children, women, and helpless old men, or make prisoners of as many as they can manage, or have strength enough to be useful to their nation. But when the enemy is apprised of their design, and coming on in arms against them, they throw themselves flat on the ground among the withered herbs and leaves, which their faces are painted to resemble. They then allow a part to pass unmolested, when, all at once, with a tremendous shout, rising up from their ambush, they pour a storm of musket-bullets on their foes. The party attacked returns the same cry. Every one shelters himself with a tree, and returns the fire of the adverse party, as soon as they raise themselves from the ground to give a second fire. Thus does the battle continue until the one party is so much weakened as to be incapable of farther resistance. But if the force on each side continues nearly equal, the fierce spirits of the savages, inflamed by the loss of their friends, can no longer be restrained. They abandon their distant war, they rush upon one another, with clubs and hatchets in their hands, magnifying their own courage, and insulting their enemies with the bitterest reproaches. A cruel combat ensues, death appears in a thousand hideous different forms, which would congeal the blood of civilized nation to behold, but which rouses the fury of savages. They trample, they insult,

29 Vigilance and circumspection.

30 Manner of fighting.

America. insult, over the dead bodies, and tear the scalp from the head. The flame rages on till it meets with no resistance; then the prisoners are secured, those unhappy men, whose fate is a thousand times more dreadful than theirs who have died in field. The conquerors set up a hideous howling, to lament the friends they have lost. They approach, in a melancholy and severe gloom to their own village; a messenger is sent to announce their arrival, and the women, with frightful shrieks, come out to mourn their dead brothers, or their husbands. When they are arrived, the chief relates, in a low voice, to the elders, a circumstantial account of every particular of the expedition. The orator proclaims aloud this account to the people; and as he mentions the names of those who have fallen, the shrieks of the women are redoubled. The men, too, join in these cries, according as each is most connected with the deceased by blood or frienship. The last ceremony is the proclamation of the victory; each individual then forgets his private misfortunes, and joins in the triumph of his nation; all tears are wiped from their eyes, and, by an unaccountable transition, they pass, in a moment, from the bitterness of sorrow to an extravagance of joy. But the treatment of the prisoners, whose fate remains all this time undecided, is what chiefly characterises the savages.

We have already mentioned the strength of their affections, or resentments. United, as they are, in small societies, connected, within themselves, by the firmest ties, their friendly affections, which glow with the most intense warmth within the walls of their own village, seldom extend beyond them. They feel nothing for the enemies of their nation; and their resentment is easily extended, from the individual who has injured them, to all others of the same tribe. The prisoners, who have themselves the same feelings, know the intentions of their conquerors, and are prepared for them.

31 Treatment of their prisoners. The person who has taken the captive attends him to the cottage, where, according to the distribution made by the elders, he is to be delivered to supply the loss of a citizen. If those who receive him have their family weakened by war or other accidents, they adopt the captive into the family, of which he becomes a member. But if they have no occasion for him, or their resentment for the loss of their friends be too high to endure the sight of any connected with those who were concerned in it, they sentence him to death. All those who have met with the same severe sentence being collected, the whole nation is assembled at the execution, as for some great solemnity. A scaffold is erected, and the prisoners are tied to the stake, where they commence their death-song, and prepare for the ensuing scene of cruelty with the most undaunted courage. Their enemies, on the other side, are determined to put it to the proof, by the most refined and exquisite tortures. They begin at the extremity of his body, and, gradually, approach the more vital parts.

32 Shocking tortures. One plucks out his nails by the roots, one by one; another takes a finger into his mouth, and tears off the flesh with his teeth; a third thrusts the finger, mangled as it is, into the bowl of a pipe made red-hot, which he smokes like tobacco; then they pound his toes and fingers to pieces between two stones; they cut circles about his joints, and gashes in the fleshy parts of his limbs, which they sear immediately with red-hot irons, cutting, burning, and pinching them, alternately; they pull off his flesh, thus mangled and roasted, bit by bit, devouring it with greediness, and smearing their faces with the blood, in an enthusiasm of horror and fury. When they have thus torn off the flesh, they twist the bare nerves and tendons about an iron, tearing and snapping them, whilst others are employed in pulling and extending his limbs in every way that can increase the torment. This continues, often, five or six hours; and sometimes, such is the strength of the savages, days together. Then they frequently unbind him, to give a breathing to their fury, to think what new torments they shall inflict, and to refresh the strength of the sufferer, who, wearied out with such a variety of unheard of torments, often falls into so profound a sleep, that they are obliged to apply the fire to awake him, and renew his sufferings. He is again fastened to the stake, and again they renew their cruelty; they stick him all over with small matches of wood that easily takes fire, but burns slowly; they continually run sharp reeds into every part of his body; they drag out his teeth with pincers, and thurst out his eyes; and, lastly, after having burned his flesh from the bones with slow fires; after having so mangled the body that it is all but one wound; after having mutilated his face in such a manner as to carry nothing human in it; after having peeled the skin from the head, and poured a heap of red hot coals or boiling water on the naked skull—they once more unbind the wretch; who, blind, and staggering with pain and weekness, assaulted and pelted on every side with clubs and stones, now up, now down, falling into their fires at every step, runs hither and thither, until one of the chiefs, whether out of compassion, or weary of cruelty, puts an end to his life with a club or dagger. The body is then put into a kettle, and this barbarous employment is succeeded by a feast as barbarous.

The women, forgetting the human as well as the female nature, and transformed into something worse than furies, are said to surpass even the men in this scene of horror; while the principal persons of the country sit round the stake, smoking and looking on, without the least emotion. What is most extraordinary, the sufferer himself, in the little intervals of his torments, smokes too, appears unconcerned, and converses with his torturers about indifferent matters. Indeed, during 33 Constancy of the sufferers.
the whole time of his execution, there seems a contest which shall exceed, they in inflicting the most horrid pains, or he in enduring them with a firmness and constancy almost above human: not a groan, not a sigh, not a distortion of countenance, escapes him: he possesses his mind entirely in the midst of his torments: he recounts his own exploits: he informs them what cruelties he has inflicted upon their countrymen; and threatens them with the revenge that will attend his death; and, though his reproaches exasperate them to a perfect madness of rage and fury, he continues his insults even of their ignorance of the art of tormenting, pointing out himself more exquisite methods, and more sensible parts of the body to be afflicted. The women have this part of courage as well as the men; and it is as rare for an Indian to behave otherwise as it would be for any European to suffer as an Indian. Such is the wonderful power of an early institution, and a ferocious thirst of glory! "I am brave and intrepid

America. trepid (exclaims the savage in the face of his tormentors); I do not fear death, nor any kind of tortures; those who fear them are cowards; they are less than women; life is nothing to those that have courage. May my enemies be confounded with despair and rage! Oh! that I could devour them, and drink their blood to the last drop."

34 Surprising contrast in the American character.

But neither the intrepidity, on one side, nor the inflexibility, on the other, are among themselves matter of astonishment: for vengeance, and fortitude, in the midst of torment, are duties which they consider as sacred; they are the effects of their earliest education, and depend upon principles instilled into them from their infancy. On all other occasions they are humane and compassionate. Nothing can exceed the warmth of their affection towards their friends, who consist of all those who live in the same village, or are in alliance with it: among these all things are common; and this, though it may in part, and among some of the tribes, arise from their not possessing very distinct notions of separate property, is chiefly to be attributed to the strength of their attachment: because, in every thing else, with their lives as well as their fortunes, they are ready to serve their friends. Their houses, their provision, even their young women, are not enough to oblige a guest. Has any one of these succeeded ill in his hunting? Has his harvest failed? or is his house burned? He feels no other effect of his misfortunes, than that it gives him an opportunity to experience the benevolence and regard of his fellow-citizens. On the other hand, to the enemies of his country, or to those who have privately offended, the American is implacable. He conceals his sentiments; he appears reconciled until by some treachery or surprise he has an opportunity of executing an horrible revenge. No length of time is sufficient to allay his resentment; no distance of place great enough to protect the object; he crosses the steepest mountains; he pierces the most impracticable forests, and traverses the most hideous bogs and desarts, for several hundreds of miles; bearing the inclemency of the season, the fatigue of the expedition, the extremes of hunger and thirst, with patience and cheerfulness, in hopes of surprising his enemy, on whom he exercises the most shocking barbarities, even to the eating of his flesh. To such extremes do the Indians push their friendship or their enmity; and such indeed, in general, is the character of all strong and uncultivated minds.

35 Treatment of their dead friends.

But what we have said respecting the Indians would be a faint picture, did we omit observing the force of their friendship, which principally appears by the treatment of their dead. When any one of the society is cut off, he is lamented by the whole: on this occasion a variety of ceremonies are practised, denoting the most lively sorrow. No business is transacted, however pressing, till all the pious ceremonies due to the dead are performed. The body is washed, anointed, and painted. Then, the women lament the loss with hideous howlings, intermixed with songs which celebrate the great actions of the deceased and his ancestors. The men mourn also, though in a less extravagant manner. The whole village is present at the interment, and the corpse is habited in their most sumptuous ornaments. Close to the body of the defunct are placed his bows and arrows, with whatever he valued most in his life, and a quantity of provision for his subsistence on the journey which he is supposed to take. This solemnity, like every other, is attended with feasting. The funeral being ended, the relations of the deceased confine themselves to their huts, for a considerable time, to indulge their grief. After an interval of some weeks, they visit the grave, repeat their sorrow, new-clothe the remains of the body, and act over again all the solemnities of the funeral. America.

Among the various tokens of their regard for their deceased friends, the most remarkable is the ceremony which they call the *feast of the dead*, or the *feast of souls*. The day for the ceremony is appointed in the council of their chiefs, who give orders for every thing which may enable them to celebrate it with pomp and magnificence; and the neighbouring nations are invited to partake of the entertainment. At this time, all who have died since the preceding feast of the kind are taken out of their graves. Even those who have been interred at the greatest distance from the villages, are diligently sought for, and conducted to this rendezvous of the dead, which exhibits a scene of horror beyond the power of description. When the feast is concluded, the bodies are drest in the finest skins which can be procured, and after being exposed for some time in this pomp, are again committed to the earth, with great solemnity, which is succeeded by funeral games. 36

Superstitions.

Their taste for war, which forms the chief ingredient in their character, gives a strong bias to their religion. *Areskoui*, or the god of battle, is revered as the great god of the Indians. Him they invoke before they go into the field; and according as his disposition is more or less favourable to them, they conclude they will be more or less successful. Some nations seem to do a kind of homage to the sun, as a symbol, or minister of the beneficence and power of the *Great Spirit:* others pay a similar homage to the moon and planets; among others, there is a number of traditions, relative to the creation of the world and the history of the gods: traditions which resemble the Grecian fables, but which are still more absurd and inconsistent. But religion is not the prevailing character of the Indians; and except when they have some immediate occasion for the assistance of their gods, they pay them no sort of worship. Like all rude nations, however, they are strongly addicted to superstition. They believe in the existence of a number of good and bad genii, or spirits, who interfere in the affairs of mortals, and produce all our happiness, or misery. It is from the evil genii, in particular, that our diseases, they imagine, proceed; and it is to the good genii we are indebted for a cure. The ministers of the genii are the jugglers, who are also the chief physicians among the savages. These jugglers are supposed to be inspired by the good genii, most commonly in their dreams, with the knowledge of future events: they are called in to the assistance of the sick, and are supposed to be informed by the genii whether they will get over the disease, and in what way they must be treated. But these spirits are extremely simple in their system of physic, and, in almost every disease, direct the juggler to the same remedy. The patient is inclosed in a narrow cabin, in the midst of which is a stone red-hot; on this they throw water, until he is well soaked with the warm vapour and his own sweat. Then they hurry him from this bagnio, and plunge him suddenly,

denly into the next river. This coarſe method, which coſts many their lives, often performs very extraordinary cures. "Some of their remedies, however, which are almoſt entirely derived from the vegetable kingdom, are certainly very powerful and efficacious, in their operation. The principal of theſe are a ſpecies of ſtillingia (perhaps a croton), ſeveral ſpecies of iris, particularly the verſicolor, and the verna; the bignonia crucigera, &c."—Theſe are principally employed by the jugglers, and old women; but moſt of the ſavages are more or leſs dextrous in curing wounds, and diſeaſes. But the power of their remedies is generally attributed by the ſavages to the magical ceremonies with which they are adminiſtered.

37 Condition of their women.

Although the Indian women generally bear the laborious part of the domeſtic œconomy, their condition, at leaſt among many of the tribes, is far from being ſo wretched, ſo ſlaviſh, and depreſſed, as has been repreſented, by Dr Robertſon, and by many other writers. We do not mean, in this place, to engage in an enquiry concerning the comparative reſpectability and importance of the female character in the various ſtages of ſociety and improvement: an inquiry this which has employed the pens of ſome of the moſt learned and eloquent writers of the preſent age, and concerning which there are ſtill various, and very oppoſite opinions. This, however, we think we may confidently and ſafely aſſert, that the condition of the women among many of the American tribes is as reſpectable and as important as it was among the Germans, in the days of Tacitus; or as it is among any other nations, with whom we are acquainted, in a ſimilar ſtage of improvement. "Their buſineſs, or employment," ſays the ingenious Mr William Bartram, "is chiefly in their houſes, except at thoſe ſeaſons when their crops of maize, &c. are growing, at which times they generally turn out with their huſbands and parents; but they are by no means compelled to do this, and one ſeldom ſees a third as many females as males at work, in their plantations." (MS. *penes* Dr B. S. Barton.) "You may depend on my aſſertion," ſays the ſame gentleman, who had ample opportunities of ſtudying the cuſtoms and manners of the ſouthern Indians, of whom he is ſpeaking, in this place, "that there are no people, any where, who love their women more than theſe Indians do, or men of better underſtanding in diſtinguiſhing the merits of the oppoſite ſex; or men more faithful in rendering ſuitable compenſation. They are courteous and polite to their women,—gentle, tender and fondling, even to an appearance of effeminacy. An Indian man ſeldom attempts to uſe a woman, of any deſcription, with indelicacy, either of action, or of language.

"In the hunting ſeaſons, that is, in autumn, and in winter, when the men are generally out in the foreſts, the whole care of the houſe or family devolves on the women: at theſe times they are obliged to undergo a great deal of labour and fatigue, ſuch as cutting wood, &c. But this labour is, in part, alleviated by the aſſiſtance of the old men, who are paſt their hunting days, or who are no longer capable of ſerving in war." But nothing more clearly ſhows the importance and reſpectability of the women among the Indians than this circumſtance, that, among ſome of the tribes, they are permitted to preſide in the councils of their country: to this we may add, that ſeveral of the Florida nations have, at different times, been governed by the wiſdom, and the prudence of female caciques.

Polygamy is practiſed by ſome nations, but it is not general. In moſt, they content themſelves with one wife; but a divorce is admitted of in caſe of adultery. No nation of the Americans is without a regular marriage, in which there are many ceremonies; the principal of which is, the bride's preſenting the bridegroom with a plate of their corn. The women, though before incontinent, are remarkable for chaſtity after marriage.

38 Their ardent love of liberty.

Liberty, in its full extent, being the darling paſſion of the Indians, their education is directed in ſuch a manner as to cheriſh this diſpoſition to the utmoſt. Hence children are never upon any account chaſtiſed with blows, and they are ſeldom even reprimanded. Reaſon, they ſay, will guide their children when they come to the uſe of it, and before that time their faults cannot be very great: but blows might damp their free and martial ſpirits, by the habit of a ſlaviſh motive to action. When grown up, they experience nothing like command, dependence, or ſubordination; even ſtrong perſuaſion is induſtriouſly withheld by thoſe who have influence among them.—No man is held in great eſteem, uleſs he has increaſed the ſtrength of his country with a captive, or adorned his hut with a ſcalp of one of his enemies.

39 Crimes and puniſhments.

Controverſies among the Indians are few, and quickly decided. When any criminal matter is ſo flagrant as to become a national concern, it is brought under the juriſdiction of the great council; but in ordinary caſes, the crime is either revenged or compromiſed by the parties concerned. If a murder be committed, the family which has loſt a relation prepares to retaliate on that of the offender. They often kill the murderer; and when this happens, the kindred of the laſt perſon ſlain look upon themſelves to be as much injured, and to have the ſame right to vengeance, as the other party. In general, however, the offender abſents himſelf; the friends ſend compliments of condolence to thoſe of the perſon who has been murdered. The head of the family, at length, appears with a number of preſents, the delivery of which he accompanies with a formal ſpeech. The whole ends, as uſual, in mutual feaſtings, in ſongs, and in dances. If the murder is committed by one of the ſame family, or cabin, that cabin has the full right of judgment within itſelf, either to puniſh the guilty with death, or to pardon him, or to oblige him to give ſome recompence to the wife or children of the ſlain. Inſtances of ſuch a crime, however, very ſeldom happen; for their attachment to thoſe of the ſame family is remarkably ſtrong, and is ſaid to produce ſuch friendſhips as may vie with the moſt celebrated in fabulous antiquity.

40 Peculiar manners of different nations.

Such, in general, are the manners and cuſtoms of the Indian nations; but almoſt every tribe has ſomething peculiar to itſelf. Among the Hurons, and the Natchez, the dignity of the chief is ſaid to be hereditary, and the right of ſucceſſion in the female line. When this happens to be extinct, the moſt reſpectable matron of the tribe, we are informed, makes choice of whom ſhe pleaſes to ſucceed.

The Cheerake are governed by ſeveral ſachems, or chiefs, elected by the different villages; as are alſo the Creeks, and the Chactaws. The two latter puniſh adultery in a woman by cutting off her hair, which they will not ſuffer to grow till the corn is ripe, the next

America. next season; but the Illinois, for the same crime, cut off the women's noses and ears.

The Indians on the Lakes are formed into a sort of empire; and the emperor is elected from the eldest tribe, which is that of the Ottowawas. This authority is very considerable. A few years ago, the person who held this rank formed a design of uniting all the Indian nations, under his sovereignty; but he miscarried in the bold attempt.

41 Longevity of the Indians.

In general, the American Indians live to a great age, although it is not easy to know from themselves the exact number of their years. It was asked of an Indian, who appeared to be extremely old, what age he was of? I am above twenty was his reply. Upon putting the question in a different form, by reminding him of certain circumstances, in former times, my *machu*, said he, spoke to me, when I was young, of the Incas; and he had seen these princes. According to this reply, there must have elapsed, from the date of his machu's (his grandfather's) remembrance to that time, a period of, at least, 232 years. The man who made this reply, appeared to be 120 years of age: for, besides the whiteness of his hair and beard, his body was almost bent to the ground; without, however, showing any other marks of debility, or suffering. This happened in 1764. This longevity, attended in general with uninterrupted health, is thought, by some writers, to be the consequence in part of their vacancy from all serious thought and employment, joined also with the robust texture and conformation of their bodily organs. If the Indians did not destroy one another, in their almost perpetual wars, and if their habits of intoxication were not so universal and incurable, they would be, of all the races of men who inhabit the globe, the most likely to extend, not only the bounds, but the enjoyments, of animal life to their utmost duration.

42 Other pictures of the Americans.

Let us now attend to other pictures which have been given of the aboriginal inhabitants of the New-World. The vices and defects of the American Indians have been, by several writers, most unaccountably aggravated, and every virtue and good quality denied them: Their cruelties have been already described, and accounted for. The following anecdote of an Algonquin woman we find adduced as a remarkable proof of their innate thirst of blood. That nation being at war with the Iroquois, she happened to be taken prisoner, and was carried to one of the villages belonging to them. Here she was stripped naked, and her hands and feet bound, with ropes, in one of their cabins. In this condition she remained ten days, the savages sleeping round her every night. The eleventh night, while they were asleep, she found means to disengage one of her hands, with which she immediately freed herself from the ropes, and went to the door. Though she had now an opportunity of escaping unperceived, her revengeful temper could not let slip so favourable an opportunity of killing one of her enemies. The attempt was manifestly at the hazard of her own life; yet, snatching up a hatchet, she killed the savage that lay next her: and, springing out of the cabin, concealed herself in a hollow tree, which she had observed the day before. The groans of the dying person soon alarmed the other savages, and the young ones immediately set out in pursuit of her. Perceiving, from her tree, that they all directed their course one way, and that no savage was near her, she left her sanctuary, and flying by an opposite direction, ran into a forest without being perceived. The second day after this happened, her footsteps were discovered; and they pursued her with such expedition, that the third day she discovered her enemies at her heels. Upon this, she threw herself into a pond of water; and diving among some weeds and bulrushes, she could just breathe above water without being perceived. Her pursuers, after making the most diligent search, were forced to return.—For 35 days this woman held on her course through woods and desarts, without any other sustenance than that which roots and wild berries afforded her. When she came to the river St Lawrence, she made, with her own hands, a kind of wicker raft, on which she crossed it. As she went by the French fort Trois-Riviers, without well knowing where she was, she perceived a canoe full of savages; and fearing they might be Iroquois, ran again into the woods, where she remained till sunset.—Continuing her course soon after, she saw Trois-Riviers; and was then discovered by a party whom she knew to be Hurons, a nation in alliance with the Algonquins. She then squatted down, behind a bush, calling out to them that she was not in a condition to be seen, because she was naked. They immediately threw her a blanket, and then conducted her to a fort, where she recounted her story.

43 Anecdote of an Algonquin woman,

44 Reproached with pusilanimity.

Personal courage has been denied them. In proof of their pusilanimity, the following incidents are quoted from Charlevoix by lord Kames, in his *Sketches of the History of Man*. "The fort de Vercheres, in Canada, belonging to the French, was, in the year 1690, attacked by the Iroquois. They approached silently, preparing to scale the palasade, when some musket-shot made them retire. Advancing a second time, they were again repulsed, wondering that they could discover none but a woman, who was seen every where. This was Madame de Vercheres, who appeared as resolute as if supported by a numerous garrison. The hopes of storming a place without men to defend it, occasioned reiterated attacks. After two days siege they retired, fearing to be intercepted in their retreat. Two years after a party of the same nation appeared before the fort so unexpectedly, that a girl of fourteen, daughter of the proprietor, had but time to shut the gate. With the young woman there was not a soul but one raw soldier. She showed herself, with her assistant, sometimes in one place, and sometimes in another; changing her dress frequently, in order to give some appearance of a garrison; and always firing opportunely. The faint-hearted Iroquois decamped without success."

There is no instance, it is said, either of a single Indian facing an individual, of any other nation, in fair and open combat, or of their jointly venturing to try the fate of battle with an equal number of any foes. Even with the greatest superiority of numbers, they dare not meet an open attack. Yet, notwithstanding this want of courage, they are still formidable; nay, it has been known, that a small party of them has routed a much superior body of regular troops: but this can only happen when they have surprised them in the fastnesses of their forests, where the covert of the wood may conceal them until they take their aim with the utmost certainty. After one such discharge they immediately retreat,

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retreat, without leaving the smallest trace of their route. It may easily be supposed, that an onset of this kind must produce confusion even among the steadiest troops, when they can neither know the number of their enemies, nor perceive the place where they lie in ambush.

45
Accused of perfidy.

Perfidy combined with cruelty has been also made a part of their character. Don Ulloa relates, That the Indians called *Natches*, in Louisiana, laid a plot of massacring, in one night, every individual belonging to the French colony established there. This plot they actually executed, notwithstanding the seeming good understanding that subsisted between them and these European neighbours. Such was the secrecy which they observed, that no person had the least suspicion of their design until the blow was struck. One Frenchman alone escaped, by favour of the darkness, to relate the disaster to his coutrymen. The compassion of a female Indian contributed also, in some measure to his exemption from the general massacre. The tribe of Natches had invited the Indians of other countries, even to a considerable distance, to join in the same conspiracy. The day, or rather the night, was fixed on which they were to make an united attack on the French colonists. It was intimated by sending a parcel of rods, more or less numerous according to the local distance of each tribe, with an injunction to abstract one rod daily; the day on which the last fell to be taken away being that fixed for the execution of their plan. The women were partners of the bloody secret. The parcels of rods being thus distributed, that belonging to the tribe of Natches happened to remain in the custody of a female. This woman, either moved by her own feelings of compassion, or by the commiseration expressed by her female acquaintances, in the view of the proposed scene of bloodshed, abstracted one day three or four of the rods, and thus anticipated the term of her tribe's proceeding in the execution of the general conspiracy. The consequence of this was, that the Natches were the only actors in the carnage; their distant associates having still several rods remaining at the time when the former made the attack. An opportunity was thereby given to the colonists in those quarters, to take measures for their defence, and for preventing a more extensive execution of the design.

It was by conspiracies similar to this that the Indians of the province of Macas, in the kingdom of Quito, destroyed the opulent city of Lagrogno, the colony of Guambaya, and its capital Sevilla del Oro; and that so completely, that it is no longer known in what place these settlements existed, or where that abundance of gold was found from which the last-mentioned city took the addition to its name. Similar ravages have been committed upon l'Imperial, in Chili, the colonies of the Missions of Chuncas, those of Darien, in Tierra Ferme, and many other places, which have afforded scenes of this barbarous ferocity. These conspiracies are always carried on in the same manner. The secret is inviolably kept, the actors assemble at the precise hour appointed, and every individual is animated with the same sanguinary purposes. The males who fall into their hands are put to death, with every shocking circumstance that can be suggested by a cool and determined cruelty. The females are carried off and preserved, as monuments of their victory, to be employed as their occasions require.

Nor can this odious cruelty and treachery, it is said, be justly ascribed to their subjection to a foreign yoke, seeing the same character belongs equally to all the original inhabitants of this vast continent, even to those who have preserved their independence most completely. Certain it is, continues Ulloa, that these people, with the most limited capacities for every thing else, display an astonishing degree of penetration and subtlety, with respect to every object that involves treachery, bloodshed, and rapine. As to these, they seem to have been all educated at one school; and a secret, referring to any such plan, no consideration on earth can extort from them.

46
Their understanding represented as weak.

Their understandings also have been represented as not less contemptible than their manners are gross and brutal. Many nations, it has been said, are neither capable of forming an arrangement for futurity, nor does their solicitude or foresight extend so far. They set no value upon those things of which they are not in some immediate want. In the evening, says father Labat, when a Carib is going to rest, no consideration will tempt him to sell his hammoch; but in the morning he will part with it for the slightest trifle. At the close of winter, a North-American, mindful of what he has suffered from the cold, sets himself with vigour to prepare materials for erecting a comfortable hut, to protect him against the inclemency of the succeeding season; but as soon as the weather becomes mild, he abandons his work, and never thinks of it more till the return of the cold compels him to resume it.—In short, to be free from labour seems to be the utmost wish of an American. They will continue, whole days, stretched in their hammocks, or seated on the earth, without changing their posture, raising their eyes, or uttering a single word. They cannot compute the succession of days, nor of weeks. The different aspects of the moon alone engage their attention, as a measure of time. Of the year they have no other conception than what is suggested to them by the alternate heat of summer, and by the cold of winter; nor have they the least idea of applying to this period the obvious computation of the months which it contains. When it is asked of any old man, in Peru, even the most civilized, what age he is of? the only answer he can give is the number of caciques he has seen. It often happens, too, that they only recollect the most distant of these princes, in whose time certain circumstances had happened peculiarly memorable, while of those who lived in a more recent period they have lost all remembrance.

47
Alleged indolence and stupidity.

The same gross stupidity is alledged to be observable in those Indians who have retained their original liberty. They are never known to fix the dates of any events in their minds, or to trace the succession of circumstances that have arisen from such events. Their imagination takes in only the *present*, and in that only what intimately concerns themselves. Nor can discipline or instruction overcome this natural defect of apprehension. In fact, the subjected Indians in Peru, who have a continual intercourse with the Spaniards, who are furnished with curates perpetually occupied in giving them lessons of religion and morality, and who mix with all ranks of the civilized society established among them, are almost as stupid and barbarous as their countrymen who have had no such advantages. The Peruvians, while they lived under the government

America. ment of their Incas, preserved the records of certain remarkable events. They had also a kind of regular government described by the historians of the conquest of Peru. This government originated entirely from the attention and abilities of their princes, and from the regulations enacted by them for directing the conduct of their subjects. This ancient degree of civilization among them gives ground to presume that their legislatures sprung from some race more enlightened than the other tribes of Indians; a race, of which no individual seems to remain in the present times.

48 Their vanity and conceit.

Vanity and conceit are said to be blended with their ignorance, and treachery. Notwithstanding all they suffer from Europeans, they still, it is said, consider themselves as a race of men far superior to their conquerors. This proud belief, arising from their perverted ideas of excellence, is universal over the whole known continent of America. They do not think it possible that any people can be so intelligent as themselves. When they are detected in any of their plots, it is their common observation, that the Spaniards, or *Virochocas*, want to be as knowing as they are. Those of Louisiana and the countries adjacent, are equally vain of their superior understanding, confounding that quality with the cunning which they themselves constantly practise. The whole object of their transactions is to over-reach those with whom they deal. Yet though faithless themselves, they never forgive the breach of promise on the part of others. While the Europeans seek their amity by presents, they give themselves no concern to secure a reciprocal friendship. Hence, probably, arises their idea, that they must be a superior race of men, in ability and intelligence, to those who are at such pains to court their alliance, and avert their enmity.

49 Their eloquence disparaged.

Their natural eloquence has also been decried. The free tribes of savages who enter into conventions with the Europeans, it is observed, are accustomed to make long, pompous, and, according to their own notions, sublime haragues, but without any method, or connection. The whole is a collection of disjointed metaphors and comparisons. The light, heat, and course of the sun, form the principal topic of their discourse; and these unintelligible reasonings are always accompanied with violent and ridiculous gestures. Numberless repetitions prolong the oration, which, if not interrupted, would last whole days: at the same time, they meditate very accurately, before hand, in order to avoid mentioning any thing but what they are desirous to obtain. This pompous faculty of making speeches is also one of the grounds on which they conceive themselves to be superior to the nations of Europe: they imagine that it is their eloquence that procures them the favours they ask. The subjected Indians converse precisely in the same style. Prolix and tedious, they never know when to stop; so that, excepting by the difference in language, it would be impossible, in this respect, to distinguish a civilized Peruvian from an inhabitant of the most savage districts to the northward.

50 All these views partial, and not free from misrepresentation.

But such partial and detached views, as the above, were they even free from misrepresentation, are not the just ground upon which to form an estimate of their character. Their qualities, good and bad (for they certainly possess both), their way of life, the state of society among them, with all the circumstances of their condition, ought to be considered in *connection*, and in regard to their mutual influence. Such a view has been given in the preceding part of this article; from which, it is hoped, their real character may be easily deduced.

Many of the disagreeable traits exhibited in the anecdotes just quoted, are, indeed, extracted from Don Ulloa; an author of credit and reputation: but a Spaniard, and evidently biassed, in some degree, by a desire to palliate the enormities of his countrymen in that quarter of the globe. And, with regard to the worst and least equivocal parts of the American character, cruelty and revenge; it may be fairly questioned, whether the instances of these, either in respect of their cause or their atrocity, be at all comparable to those exhibited in European history, and staining the annals of Christendom:—to those, for instance, of the Spaniards themselves, at their first discovery of America; to those indicated by the engines found on board their mighty Armada, in 1588; to those which, in cold blood, were perpetrated by the Dutch at Amboyna; to the dragoonings of the French; to their religious massacres: or, even, to the *tender mercies* of the Inquisition?

51 The physical descriptions of Buffon and de Pauw refuted.

Still harsher, however, are the descriptions given by *Buffon* and *de Pauw*, of the natives of this whole continent, in which the most mortifying degeneracy of the human race, as well as of all the inferior animals, is asserted to be conspicuous. Against these philosophers, or rather theorists, however, the Americans have found an able advocate in the Abbé *Clavigero*; an historian, who, not only from his being a native of America, but also from his situation, and long residence in Mexico, has been enabled to obtain the best means of information, and who, though himself a subject of Spain, appears superior to prejudice, and disdains in his description the glosses of policy. *Hist. of Mexico.* v. II. p. 328.

52 Stature, shape, &c.

Concerning the stature of the Americans, M. de Pauw says, that although, in general, it is not equal to the stature of the Castilians, there is but little difference between them. But the Abbé Clavigero evinces, that the Indians who inhabit those countries lying between 9 and 40 degrees of north latitude, which are the limits of the discoveries of the Spaniards, are more than five Parisian feet in height, and that those who do not reach that stature, are as few in number amongst the Indians as they are amongst the Spaniards. It is besides certain, that many of the American nations, such as the *Apaches*, the *Hiaquese*, the *Pimese*, and *Cochimies*, are at least as tall as the tallest Europeans; and that, in all the vast extent of the New-World, no race of people has been found, except the Esquimaux, in the north, and west, and the Yacana-cunnees, and Pesherais, &c. in the south, so diminutive in stature as the Laplanders, the *Samojeds*, and Tartars, in the north of the Old-Continent. In this respect, therefore, the inhabitants of the two continents are upon an equality.

Of the shape and character of the Mexican Indians, the Abbé gives a most advantageous description; which he asserts, no one, who reads it, in America, will contradict, unless he views them with the eye of a prejudiced mind. It is true, that Ulloa says, in speaking of the Indians of Quito, he had observed that "imperfect people abounded among them; that they were either

irregularly

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regularly diminutive, or monstrous in some other respect; that they became either insensible, dumb, or blind; or wanted some limb of their body." Having, therefore, made some inquiry respecting this singularity of the Quitans, the Abbé found, that such defects were neither caused by what he calls bad humours, nor by the climate, but by the mistaken and blind humanity of their parents, who, in order to free their children from the hardships and toils to which the healthy Indians are subjected by the Spaniards, fix some deformity or weakness upon them, that they may become useless: a circumstance of misery which does not happen in other countries of America, nor in those places of the same kingdom of Quito, where the Indians are under no such oppression. M. de Pauw, and in agreement with him, Dr Robertson, says, that no deformed persons are to be found among the savages of America; because, like the ancient Lacedæmonians, they put to death those children which are born hunchbacked, blind, or defective in any limb; but that in those countries where they are formed into societies, and where the vigilance of their rulers prevents the murder of such infants, the number of their deformed individuals is greater than it is in any country of Europe. This would make an exceedingly good solution of the difficulty if it were true: but if, possibly, there has been in America a tribe of savages who have imitated the barbarous example of the celebrated Lacedæmonians, it is certain that those authors have no grounds to impute such inhumanity to the rest of the Americans; and it has not been the practice, at least with the far greater part of those nations, as may be demonstrated from the attestations of authors who are the best acquainted with their customs.

No argument against the New-World can be drawn from the colour of the Americans; for their colour is less distant from the white of the Europeans than it is from the black of the Africans, and a great part of the Asiatics. The hair of the Mexicans, and of the greater part of the Indians, is as we have already said, coarse and thick: on their faces they appear to have little, and in general none on their arms and legs: but it is an error to say, as M. de Pauw does, that they are entirely destitute of hair in all the other parts of their body.

53 Errors concerning their want of beard, &c.

This is one of the many passages in the *Philosophical Researches*, at which the Mexicans, and all the other nations, must smile, to find an European philosopher so eager to divest them of the dress they had from nature. Don Ulloa, indeed, in the description which he gives of the Indians of Quito, says, that hair neither grows upon the men nor upon the women when they arrive at puberty, as it does on the rest of mankind; but whatever singularity may attend the Quitans, or occasion this circumstance, there is no doubt that among the Americans in general, the period of puberty is accompanied with the same symptoms as it is among other nations of the world. In fact, with the North-Americans, it is disgraceful to be hairy on the body. They say it likens them to hogs. They, therefore, pluck the hair as fast as it appears. But the traders who marry their women, and prevail on them to discontinue this practice, say, that nature is the same with them as with the whites. As to the beards of the men, had Buffon, or de Pauw, known the pains and trouble it costs them to pluck out by the roots the hair that grows on their faces, they would have seen that nature had not been deficient in that respect. Every nation has its customs. "I have seen an Indian beau, with a looking-glass in his hand (say Mr Jefferson), examining his face, for hours together, and plucking out, by the roots, every hair he could discover, with a kind of tweezer made of a piece of fine brass wire, that had been twisted round a stick, and which he used with great dexterity."

54 Their form and aspect contrasted with those of some other nations.

The very aspect of an Angolan, a Mandingan, or a Congan, would have shocked M. de Pauw, and make him recal the censure which he passes on the colour, the make, and hair of the Americans. What can be imagined more contrary to the idea *we* have of beauty, and the perfection of the human frame, than a man, whose skin is black as ink, whose head and face are covered with black wool, instead of hair, whose eyes are yellow and bloody, whose lips are thick and blackish, and whose nose is flat? Such are the inhabitants of a very large portion of Africa, and of many islands of Asia. What men can be more imperfect than those who measure no more than four feet in stature, whose faces are long and flat, the nose compressed, the irides yellowish black, the eye-lids turned back towards the temples, the cheeks extraordinarily elevated, their mouths monstrously large, their lips thick and prominent, and the lower part of their visages extremely narrow? Such, according to Count de Buffon, are the Laplanders, the Zemblans, the Borandines, the Samojeds, and the Tartars, in the East. What objects more deformed than men whose faces are too long and wrinkled even in their youth, their noses thick and compressed, their eyes small and sunk, their cheeks very much raised, the upper jaw low, their teeth long and disunited, eye-brows so thick that they shade their eyes, the eye-lids thick, some bristles on their faces instead of beard, large thighs and small legs? Such is the picture Count de Buffon gives of the Tartars; that is, of those people who, as he says, inhabit a tract of land in Asia 1200 leagues long and upwards, and more than 750 broad. Amongst these, the Calmucks are the most remarkable for their deformity: which is so great, that according to Tavernier, they are the most brutal men of all the universe. Their faces are so broad that there is a space of five or six inches between their eyes, as Count de Buffon himself affirms. In Calicut, in Ceylon, and in other countries of India, there is, say Pyrard, and other writers, on those regions, a race of men who have one, or both, of their legs as thick as the body of a man; and that this deformity among them is almost hereditary

If we were, in like manner, to go through the nations of Asia and Africa, we should hardly find any extensive country where the colour of men is not darker, where there are not greater irregularities observed, and grosser defects to be found in them, than even the penetrating eye of de Pauw could discover in the Americans. The colour of the latter is a good deal clearer than that of almost all the Africans and the inhabitants of south Asia. Even their alleged scantiness of beard is common to the inhabitants of the Philippine-Islands, and of all the Indian-Archipelago, to the famous Chinese, Japannese, Tartars, and many other nations of the Old-Continent. The imperfections of the Americans, however great they may be represented to be, are

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are, certainly, not comparable with the defects of that immenſe people, whoſe character we have ſketched, and others whom we omit.

55 Their conſtitution and corporal abilities.

M. de Pauw repreſents the Americans to be a feeble and diſeaſed ſet of nations; and, in order to demonſtrate the weakneſs and diſorder of their phyſical conſtitution, adduces ſeveral proofs equally ridiculous and ill-founded, and which it will not be expected we ſhould enumerate. He alleges, among other particulars, that they were overcome in wreſtling by all the Europeans, and that they ſunk under a moderate burthen; that by a computation made, 200,000 Americans were found to have periſhed, in one year, from carrying of baggage. With reſpect to the firſt point, the Abbé Clavigero obſerves, it would be neceſſary that the experiment of wreſtling was made between many individuals of each continent, and that the victory ſhould be atteſted by the Americans, as well as by the Europeans. It is not, however, meant to inſiſt, that the Americans are ſtronger than the Europeans. They may be leſs ſtrong, without the human ſpecies have degenerated in them. The Swiſs are ſtronger than the Italians; and ſtill we do not believe the Italians are degenerated nor do we tax the climate of Italy. The inſtance of 200,000 Americans having died, in one year, under the weight of baggage, were it true, would not convince us, ſo much of the weakneſs of the Americans, as of the inhumanity of the Europeans. In the ſame manner that theſe 200,000 Americans periſhed, 200,000 Pruſſians would alſo have periſhed, had they been obliged to make a journey of between 300 and 400 miles, with 100 pounds of burden upon their backs: if they had collars of iron about their necks, and were obliged to carry that load over rocks and mountains; if thoſe who became exhauſted with fatigue, or wounded their feet ſo as to impede their progreſs, had their heads cut off that they might not retard the pace of the reſt; and if they were not allowed but a ſmall morſel of bread to enable them to ſupport ſo ſevere a toil. Las Caſas, from whom M. de Pauw got the account of the 200,000 Americans, who died under the fatigue of carrying baggage, relates, alſo, all the abovementioned circumſtances. If that author, therefore, is to be credited in the laſt, he is alſo to be credited in the firſt. But, a philoſopher who vaunts the phyſical and moral qualities of Europeans, over thoſe of the Americans, would have done better, we think, to have ſuppreſſed facts ſo opprobrious to the Europeans themſelves.

56 Their labour and induſtry.

Nothing, in fact, demonſtrates ſo clearly the robuſtneſs of the Americans as thoſe various, and laſting, fatigues in which they were continually engaged. M. de Pauw ſays, that when the New-World was diſcovered, nothing was to be ſeen but thick woods; that, at preſent, there are ſome lands cultivated, not by the Americans, however, but by the Africans, and Europeans; and that the ſoil in cultivation is to the ſoil which is uncultivated as 2000 to 2,000,000. Theſe three aſſertions the Abbé Clavigero demonſtrates to be preciſely ſo many errors. Since the conqueſt, the Americans alone have been the people who have ſupported all the fatigues of agriculture in all the vaſt countries of the continent of South-America, and in the greater part of thoſe of North America ſubject to the crown of Spain. No European is ever to be ſeen employed in the labours of the field. The Moors who, in compariſon of the Americans, are very few in number in the kingdom of New-Spain, are charged with the culture of the ſugar-cane, and tobacco, and the making of ſugar; but the ſoil deſtined for the cultivation of thoſe plants is not, with reſpect to all the cultivated land of that country, in the proportion of one to two thouſand. The Americans are the people who labour on the ſoil. They are the tillers, the ſowers, the weeders, and the reapers of the wheat, of the maize, of the rice, of the beans, and other kinds of grain or pulſe, of the cocoa, of the vanilla, of the cotton, of the indigo, and all other plants uſeful to the ſuſtenance, the cloathing, and commerce of thoſe provinces; and without them ſo little can be done, that in the year 1762, the harveſt of wheat was abandoned, in many places, on account of a ſickneſs which prevailed, and prevented the Indians from reaping it. But this is not all; the Americans are they who cut and tranſport all the neceſſary timber from the woods; who cut, tranſport, and work the ſtones: who make lime, plaſter, and tiles: who conſtruct all the buildings of that kingdom, except a few places where none of them inhabit; who open and repair all the roads, who make the canals and ſluices, and clean the cities. They work in many mines of gold, of ſilver, of copper, &c.: they are the ſhepherds, herdſmen, weavers, potters, baſket-makers, bakers, curriers, day-labourers, &c.: in a word, they are the perſons who bear all the burden of public labours. Theſe, ſays our juſtly indignant author, are the employments of the weak, daſtardly, and uſeleſs Americans; while the vigorous M. de Pauw, and other indefatigable Europeans, are occupied in writing invectives againſt them.

57 Theſe a ſufficient proof of their healthineſs and ſtrength.

Theſe labours, in which the Indians are continually employed, certainly, atteſt their healthineſs and ſtrength; for if they are able to undergo ſuch fatigues, they can not be diſeaſed, nor have an exhauſted ſtream of blood in their veins, as M. de Pauw inſinuates. In order to make it believed that their conſtitutions are vitiated, he copies whatever he finds written by hiſtorians of America, whether true or falſe, reſpecting the diſeaſes which reign in ſome particular countries of that great continent. It is not to be denied, that in ſome countries in the wide compaſs of America, men are expoſed, more than elſewhere, to the diſtempers which are occaſioned by the intemperature of the air, or the pernicious quality of the aliments; but it is certain, according to the aſſertion of many reſpectable authors, acquainted with the New-World, that the American countries are, for the moſt part healthy; and if the Americans were diſpoſed to retaliate on M. de Pauw, and other European authors, who write as he does, they would have abundant ſubject of materials to throw diſcredit on the clime of the Old-Continent, and the conſtitution of its inhabitants in the endemic diſtempers which prevail there.

Laſtly, the ſuppoſed feebleneſs and unſound bodily habit of the Americans do not correſpond with the length of their lives. Among thoſe Americans whoſe great fatigues and exceſſive toils do not anticipate their death, there are not a few who reach the age of 80, 90, and 100, or more years, as formerly mentioned; and, what is more, without there being obſerved in them that decay which time commonly produces in the hair, in the teeth, in the ſkin, and in the muſcles of the human body. This phenomenon, ſo much admired by the

the Spaniards who reſide in Mexico, cannot be aſcried to any other cauſe than the vigour of their conſtitutions, the temperance of their diet, and the ſalubrity of their clime. Hiſtorians, and other perſons who have ſojourned there for many years, report the ſame thing of other countries of the New-World.

58 Their mental qualities

As to the mental qualities of the Americans, M. de Pauw has not been able to diſcover any other characters than a memory ſo feeble, that to-day they do not remember what they did yeſterday; a capacity ſo blunt, that they are incapable of thinking or putting their ideas in order; a diſpoſition ſo cold, that they feel no excitement of love; a daſtardly ſpirit, and a genius that is torpid, and indolent. Many other Europeans, indeed, and what is ſtill more wonderful, many of thoſe children or deſcendants of Europeans who are born in America, think as M. de Pauw does; ſome from ignorance, ſome from want of reflection, and others from hereditary prejudice and prepoſſeſſion. But all this, and much more, would not be ſufficient to invalidate the teſtimonies of other Europeans, whoſe authority has a great deal more weight, both becauſe they were men of great judgment, learning and knowledge, of theſe countries, and becauſe they give their teſtimony in favour of ſtrangers, againſt their own countrymen. In particular, Acoſta, whoſe *Natural* and *Moral Hiſtory* even de Pauw commends as *an excellent work*, employs the whole ſixth book in demonſtrating the good ſenſe of the Americans, by an explanation of their ancient government, their laws, their hiſtories in paintings and knots, calenders, &c. M. de Pauw thinks the Americans are beſtial; Acoſta, on the other hand, reputes thoſe perſons weak and preſumptuous who think them ſo. M. de Pauw ſays, that the moſt acute Americans were inferior in induſtry and ſagacity to the rudeſt nations of the Old-Continent; Acoſta extols the civil government of the Mexicans above many republics of Europe. M. de Pauw finds, in the moral and political conduct of the Americans, nothing but barbarity, extravagance, and brutality; and Acoſta finds there, laws which are admirable, and worthy of being preſerved for ever.

59 M. de Pauw's proofs of American cowardice.

M. de Pauw denies them courage, and alleges the conqueſt of Mexico as a proof of their cowardice. "Cortes (ſays he), conquered the empire of Mexico with 450 vagabonds, and 15 horſes, badly armed: his miſerable artillery conſiſted of ſix falconets, which would not at the preſent day be capable of exciting the fears of a fortreſs defended by invalids. During his abſence, the capital was held in awe by the half of his troops. What men! what events!— It is confirmed by the depoſitions of all hiſtorians, that the Spaniards entered, the firſt time, into Mexico without making one ſingle diſcharge of their artillery. If the title of hero is applicable to him who has the diſgrace to occaſion the death of a great number of rational animals, Ferdinand Cortes might pretend to it; otherwiſe I do not ſee what true glory he has acquired by the overthrow of a tottering monarchy, which might have been deſtroyed, in the ſame manner, by any other aſſaſſin of our continent."

60 Refuted.

Theſe paſſages indicate either M. de Pauw's ignorance of the hiſtory of the conqueſt of Mexico, or a wilful ſuppreſſion of what would openly contradict his ſyſtem; ſince all who have read that hiſtory know well, that the conqueſt of Mexico was not made with 450 men, but with more than 200,000. Cortes himſelf, to whom it was of more importance than to M. de Pauw to make his bravery conſpicuous, and his conqueſt appear glorious, confeſſes the exceſſive number of the allies who were under his command, at the ſiege of the capital, and combated with more fury againſt the Mexicans than the Spaniards themſelves. According to the account which Cortes gave to the emperor Charles V. the ſiege of Mexico began with 87 horſes, 848 Spaniſh infantry, armed with guns, croſs-bows, ſwords, and lances, and upwards of 75,000 allies, of Tlaſcala, Huexotzinco, Cholula, and Chalco, equipped with various ſorts of arms; with three large pieces of cannon of iron, 15 ſmall of copper, and 13 brigantines. In the courſe of the ſiege were aſſembled the numerous nations of the Otomies, the Cohuixcas, and Matlazinkas, and the troops of the populous cities of the lakes; ſo that the army of the beſiegers not only exceeded 200,000, but amounted to 400,000 according to the letter from Cortes; and beſides theſe, 3000 boats and canoes came to their aſſiſtance. Did it betray cowardice to have ſuſtained, for full 75 days, the ſiege of an open city, engaging, daily, with an army ſo large, and in part provided with arms ſo ſuperior, and at the ſame time having to withſtand the ravages of famine? Can they merit the charge of cowardice, who, after having loſt ſeven of the eight parts of their city, and about 50,000 citizens, part cut off by the ſword, part by famine and ſickneſs, continued to defend themſelves until they were furiouſly aſſaulted in the laſt hold which was left them? See the article Mexico.

61 Remarkable inſtance of calumny in M. de Pauw.

According to M. de Pauw, "the Americans at firſt "were not believed to be men, but rather ſatyrs, or "large apes, which might be murdered, without re- "morſe, or reproach. At laſt, in order to add inſult "to the oppreſſion of thoſe times, a pope made an ori- "ginal bull, in which he declared, that being deſirous "of founding biſhoprics in the richeſt countries in A- "merica, it pleaſed him and the Holy-Spirit, to ac- "knowledge the Americans to be true men: in ſo "far, that without this deciſion of an Italian, the in- "habitants of the New-World would have appeared, "even at this day, to the eyes of the faithful, a race "of equivocal men. There is no example of ſuch a "deciſion ſince this globe has been inhabited by men "and apes." Upon this paſſage the Abbè Clavigero animadverts, as being a ſingular inſtance of calumny and miſrepreſentation; and gives the following hiſtory of the deciſion alluded to.

62 Occaſion of the famous bull of Pope Paul III.

"Some of the firſt Europeans who eſtabliſhed themſelves in America, not leſs powerful than avaricious, deſirous of enriching themſelves to the detriment of the Americans, kept them continually employed, and made uſe of them as ſlaves; and, in order to avoid the reproaches, which were made them, by the biſhops and miſſionaries, who inculcated humanity, and the giving liberty to thoſe people to get themſelves inſtructed in religion, that they might do their duties towards the church, and their families, alleged, that the Indians were by nature ſlaves and incapable of being inſtructed; and many other falſehoods of which the Chronicler Herrera makes mention againſt them. Theſe zealous eccleſiaſtics being unable, either by their authority, or preaching, to free thoſe unhappy converts from the tyranny of ſuch miſers, had recourſe to the Catholic kings, and,

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at last, obtained from their justice and clemency, those laws, as favourable to the Americans as honourable to the court of Spain, that compose the Indian code, which were chiefly due to the indefatigable zeal of the bishop de las Casas. On another side, Garces, bishop of Tlascala, knowing that those Spaniards bore, notwithstanding their perversity, a great respect to the decision of the vicar of Jesus Christ, made application, in the year 1586, to Pope Paul III. by that famous letter, of which we have made mention; representing to him the evils which the Indians suffered from the wicked Christians, and praying him to interpose his authority in their behalf. The pope, moved by such heavy remonstrances, dispatched, the next year, the original bull, a faithful copy of which we have here subjoined (A), which was not made, as is manifest, to declare the Americans true men; for such a piece of weakness was very distant from that or any other pope: but solely to support the natural rights of the Americans, against the attempts of their oppressors, and to condemn the injustice and inhumanity of those, who, under the pretence of supposing those people idolatrous, or incapable of being instructed, took from them their property and their liberty, and treated them as slaves and beasts."

63 Representation of Columbus.

But if, at first, the Americans were esteemed satyrs, nobody can better prove it than Christopher Columbus, their discoverer. Let us hear, therefore, how that celebrated admiral speaks, in his account to Ferdinand and Isabella, of the first satyrs he saw in the island of Haiti, or Hispaniola. "I swear," he says, "to your majesties, that there is not a better people in the world than these, more affectionate, affable, or mild. They love their neighbours as themselves; their language is the sweetest, the softest, and the most cheerful; for they always speak smiling; and although they go naked, let your majesties believe me, their customs are very becoming; and their king, who is served with great majesty, has such engaging manners, that it gives great pleasure to see him, and also to consider the great retentive faculty of that people, and their desire of knowledge, which incites them to ask the causes and the effects of things."

64 Conclusions concerning the capacities of the Americans.

"We have had intimate commerce with the Americans (continues the Abbé): have lived, for some years, in a seminary destined for their instruction; saw the erection and progress of the royal college of Guadaloupe founded, in Mexico, by a Mexican Jesuit, for the education of Indian children; had, afterwards, some Indians among our pupils; had particular knowledge of many American rectors, many nobles, and numerous artists; attentively, observed their character, their genius, their disposition, and manner of thinking; and have examined, besides, with the utmost diligence, their ancient history, their religion, their government, their laws, and their customs. After such long experience and study of them, from which we imagine ourselves, enabled to decide, without danger of erring, we declare to M. de Pauw, and to all Europe, that the mental qualities of the Americans are not in the least inferior to those of the Europeans; that they are capable of all, even the most abstract, sciences; and that if equal care was taken of their education, if they were brought up from childhood in seminaries, under good masters, were protected and stimulated by rewards, we should see rise among the Americans, philosophers, mathematicians, and divines, who would rival the first in Europe."

65 Their ingenuity, &c. asserted.

But, although we should suppose, that, in the torrid climates of the New-World, as well as in those of the Old, especially under the additional depression of slavery, there was an inferiority of the mental powers; the Chilese, and the North-Americans, have discovered higher rudiments of human excellence and ingenuity than have, perhaps, ever been known among tribes in a similar state of society, in any part of the world.

M. de Pauw affirms, that the Americans were unacquainted with the use of money, and quotes the following well-known passage from Montesquieu: "Imagine to yourself that, by some accident, you are placed in an unknown country; if you find money there, do not doubt that you are arrived among a polished people." But, if by money we are to understand a piece of metal with the stamp of the prince, or of the public, the want of it in a nation is no token of barbarity. The Athenians employed oxen for money, as the Romans did sheep. The Romans had no coined money till the time of

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(A) Paulus papa III. universis Christi Fidelibus presentes Literas inspecturis Salutem & Apostolicam Benedictionem—"Veritas ipsa, quæ nec falli, nec fallere potest, cum Prædicatores Fidei ad officium predicationis destinaret, dixisse dignoscitur: *Euntes docete omnes gentes*: omnes, dixit, absque omni delectu, cum omnes Fidei disciplina capaces existant. Quod videns & invidens ipsius humani generis æmulus, qui bonis operibus, ut pereant, semper adversatur, modum excogitavit hactenus inauditum, quo impediret, ne Verbum Dei Gentibus, ut salvæ fierent, prædicaretur: ut quosdam suos satellites commovit, qui suam cupiditatem adimplere cupientes. Occidentales & Meridionales Indos, & alias Gentes, quæ temporibus istis ad nostram notitiam pervenerunt, sub prætextu quod Fidei Catholicæ expertes existant, uti bruta animalia, ad nostra obsequia redigendos esse, passim asserere præsumant, & eos in servitutem redigunt tantis afflictionibus illos urgentes, quantis vix bruta animalia illis servientia urgeant. Nos igitur, qui ejusdem Domini nostri vices, licet indigni, gerimus in terris, & Oves gregis sui nobis commissas, quæ extra ejus Ovile sunt, ad ipsum Ovile toto nixu exquirimus, attendentes Indos ipsos, ut pote veros homines, non solum Christianæ Fidei capaces existere, sed, ut nobis innotuit, ad Fidem ipsam promptissime currere, ac volentes super his congruis remediis providere, prædictos Indos & omnes alias gentes ad notitiam Christianorum in posterum deventuras, licet extra fidem Christi existant, sua libertate & dominio hujusmodi uti, & potiri, & gaudere libere, & licere posse, nec in servitutem redigi debere, ac quicquid secus fieri contigerit irritum & inane, ipsosque Indos, & alias Gentes Verbi Dei prædicatione, & exemplo bonæ vitæ ad dictam Fidem Christi invitandos fore. Auctoritate Apostolica per præsentes literas decernimus, & declaramus, non obstantibus prœmissis, cæterisque contrariis quibuscunque." Datum Romæ anno 1537. IV. Non. Iun. Pontificatus nostri anno III. Quæsta, è non altra è quella famosa bolla, per la quale s' è fatto un si grande schiamazzo.

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of Servius Tullius, nor had the Persians until the reign of Darius Hystaspes. But, if by money is understood a sign representing the value of merchandise, the Mexicans, and other nations of Anhuac, employed money in their commerce. The cacao, of which they made constant use in the market to purchase whatever they wanted, was employed for this purpose, as salt is in Abyssinia.

It has been affirmed, that stone bridges were unknown in America, when it was first discovered; and that the natives did not know how to form arches. But, these assertions are erroneous. The remains of the ancient palaces of Tezcucco, and, still more, their vapour baths, show the ancient use of arches and of vaults among the Mexicans. But the ignorance of this art would have been no proof of barbarity. Neither the Egyptians nor Babylonians understood the construction of arches.

M. de Pauw affirms, that the palace of Montezuma was nothing else than a *hut*. But, it is certain, from the affirmation of all the historians of Mexico, that the army under Cortes, consisting of 6,400 men, were all lodged in the palace; and there remained still sufficient room for Montezuma and his attendants.

66 Tokens of science.

The advances which the Mexicans had made in the noble science of astronomy, is, perhaps, the most suprising proof of their attention and sagacity: for it appears, from Abbé Clavigero's *History*, that they not only counted 365 days to the year, but also knew of the excess of about six hours in the solar over the civil year, and remedied the difference, by means of intercalary days. See ASTRONOMY, nº 5.

67 Specimen of their morality

Of American morality, the following exhortation of a Mexican to his son may serve as a specimen. "My son, who art come into the light from the womb of thy mother like a chicken from the egg, and, like it, art preparing to fly through the world, we know not how long Heaven will grant to us the enjoyment of that precious gem which we possess in thee; but however short the period, endeavour to live exactly, praying God continually to assist thee. He created thee: thou art his property. He is thy father, and loves thee still more than I do: repose in him thy thoughts, and day and night direct thy sighs to him. Reverence and salute thy elders, and hold no one in contempt. To the poor and distressed be not dumb, but rather use words of comfort. Honour all persons, particularly thy parents, to whom thou owest obedience, respect and service. Guard against imitating the example of those wicked sons, who, like brutes that are deprived of reason, neither reverence their parents, listen to their instruction, nor submit to their correction; because whoever follows their steps will have an unhappy end, will die in a desperate or sudden manner, or will be killed, and devoured by wild beasts.

"Mock not, my son, the aged or the imperfect. Scorn not him whom you see fall into some folly, or transgression, nor make him reproaches; but restrain thyself, and beware lest thou fall into the same error which offends thee in another. Go not where thou art not called, nor interfere in that which does not concern thee. Endeavour to manifest thy good breeding, in all thy words, and actions. In conversation, do not lay thy hands upon another, nor speak too much, nor interrupt or disturb another's discourse. When any one discourses with thee, hear him, attentively, and hold thyself in an easy attitude, neither playing with thy feet, nor putting thy mantle to thy mouth, nor spitting too often, nor looking about you here and there, nor rising up frequently if thou art sitting; for such actions are indications of levity and low-breeding."—The father proceeds to mention several particular vices which are to be avoided, and concludes—"Steal not, nor give thyself to gaming; otherwise thou wilt be a disgrace to thy parents, whom thou oughtest rather to honour for the education they have given thee. If thou wilt be virtuous, thy example will put the wicked to shame. No more my son; enough hath been said in discharge of the duties of a father. With these counsels I wish to fortify thy mind. Refuse them not, nor act in contradiction to them; for on them thy life, and all thy happiness depend."

As ranging on the same side with the Abbé Clavigero, our countryman Mr Jefferson deserves particular attention. This gentleman, in his *Notes on the State of Virginia*, &c. has taken occasion to combat the opinions of Buffon; and seems, in many instances, to have fully refuted them, both by argument and by facts.

68 Notions of M. de Buffon concerning the degeneracy of animal nature in America.

The French philosopher asserts, "That living nature is less active, less energetic, in the New-World than in the Old." He affirms, 1. That the animals common to both continents are smaller in America. 2. That those peculiar to the New are on an inferior scale. 3. That those which have been domesticated in both have degenerated in America; and, 4. That it exhibits fewer species of living creatures. The cause of this he ascribes to the diminution of heat in America, and to the prevalence of humidity from the extension of its lakes and waters over a prodigious surface. In other words, he affirms that *heat* is friendly, and *moisture* adverse, to the production and developement of the larger quadrupeds.

69 The hypothesis that moisture is unfriendly to animal growth, considered.

The hypothesis that moisture is unfriendly to animal growth, Mr Jefferson shows to be contradicted by observation, and by experience. It is by the assistance of heat and moisture that vegetables are elaborated from the elements. Accordingly, we find that the more humid climates produce plants in greater profusion than the dry. Vegetables are immediately, or remotely, the food of every animal; and, from the uniform operation of nature's laws, we discern, that, in proportion to the quantity of food, animals are not only multiplied in their numbers, but improved in their size. Of this last opinion is the Count de Buffon himself, in another part of his work: "En general, il paroit que les pays un peu *froids* conviennent mieux á nos bœufs que les pays chauds, et qu'ils sont d'autant plus gros et plus grands que le climat est plus *humide* et plus abondans en paturages. Les bœufs de Danemarck, de la Podolie, de l'Ukraine, et de la Tartarie qu'habitent les Calmouques, sont les plus grands de tous."

70 The contrary maintained by Mr Jefferson.

Here, then, a race of animals, and one of the largest too, has been increased in its dimensions by cold and moisture, in direct opposition to the hypothesis, which supposes that these two circumstances diminish animal bulk, and that it is their contraries, heat and dryness, which enlarge it. But, to try the question on more general ground, let us take two portions of the earth, Europe and America for instance, sufficiently extensive to give operation to general causes: let us consider the circumstances peculiar to each, and observe their effects

fects on animal nature. America, running through the torrid, as well as temperate, zone, has more heat collectively taken, than Europe. But Europe, according to their hypothesis, is the driest. They are equally adapted, then, to animal productions; each being endowed with one of those causes which befriend animal growth, and with one which opposes it. Let us, then, take a comparative view of the quadrupeds of Europe and of America, presenting them to the eye in three different tables; in one of which shall be enumerated those found in both countries; in a second, those found in one only; in a third, those which have been domesticated in both. To facilitate the comparison, let those of each table be arranged in gradation, according to their sizes, from the greatest to the smallest, so far as their sizes can be conjectured. The weights of the large animal shall be expressed in the English averdupoise pound and its decimals; those of the smaller in the ounce and its decimals. Those which are marked thus*, are actual weights of particular subjects, deemed among the largest of their species. Those marked thus†, are furnished by judicious persons, well acquainted with the species, and saying, from conjecture only, what the largest individual they had seen would probably have weighed. The other weights are taken from Messrs Buffon and D'Aubenton, and are of such subjects as came casually to their hands for dissection.

"A Comparative View of the Quadrupeds of Europe and of America.

TABLE I. *Aboriginals of both.*	Europe.	America.
	lb.	lb.
Mammouth (B)		
Buffalo. Bison		*1800
White-bear. Ours blanc		
Carribou. Renne		
Bear. Ours	153.7	*410
Elk. Elan. Original, palmated		
Red-deer. Cerf	288.8	*273
Fallow-deer. Daim	167.8	
Wolf. Loup	69.8	
Roe. Chevreuil	56.7	
Glutton. Glouton. Carcajou		
Wild-cat. Chat sauvage		†30
Lynx. Loup cervier	25.	
Beaver. Castor	18.5	*45
Badger. Blaireau	13.6	
Red-fox. Renard	13.5	
Grey-fox. Isatis		
Otter. Loutre	8.9	†12
Monax. Marmotte	6.5	
Vison. Fouine	2.8	
Hedgehog. Herisson	2.2	
Martin. Marte	1.2	†6
	oz.	
Water-rat. Rat d'eau	7.5	
Wesel. Belette	2.2	oz.
Flying-squirril. Polatouche	2.2	†4
Shrew-mouse. Musaraigne	1.	

TABLE II. *Aboriginals of the one only.*

EUROPE.		AMERICA.	
	lb.		lb.
Sanglier. Wild boar	280.	Tapir	534.
Mouflin. Wild sheep	56.	Elk, round horned	†450.
Bouquetin. Wild goat		Puma	
Lievre. Hare	7.6	Jaguar	218.
Lapin. Rabbit	3.4	Cabiai	109.
Putois. Polecat	3.3	Tamanoir	109.
Genette	3.1	Tamandua	65.4
Desman. Muskrat	oz.	Cougar of N. Amer.	75.
Ecureuil. Squirrel	12.	Cougar of S. Amer.	59.4
Hermine. Ermin	8.2	Ocelot	
Rat. Rat	7.5	Pecari	46.3
Loirs	3.1	Jaguaret	43.6
Lerot. Dormouse	1.8	Alco	
Taupe. Mole	1.2	Lama	
Hamster	.9	Paco	
Zisel		Paca	32.7
Leming		Serval	
Souris. Mouse	.6	Sloth. Unau	$27\frac{1}{4}$
		Saricovienne	
		Kincajou	
		Tatou Kabassou	21.8
		Urson. Urchin	
		Racoon. Raton	16.5
		Coati	
		Coendou	16.3
		Sloth. Aï	13.
		Sapajou Ouarini	
		Sapajou Coaita	9.8
		Tatou Encubert	
		Tatou Apar	
		Tatou Cachica	7.
		Little Coendou	6.5
		Opossum. Sarigue	
		Tapeti	
		Margay	
		Crabier	
		Agouti	4.2
		Sapajou Saï	3.5
		Tatou Cirquinçon	
		Tatou Tatonate	3.3
		Mouffette Squash	
		Mouffette Chinche	
		Mouffette Conepate. Scunk	
		Mouffette. Zorilla	
		Whabus. Hare. Rabbit	
		Aperea	
		Akouchi	
		Ondatra. Muskrat	
		Pilori	
		Great grey-squirrel	†2.7
		Fox squirrel, of Virginia	†2.625
		Surikate	2.
		Mink	†2.
		Sapajou. Sajou	1.8

(B) The bones of the Mammouth, or, as it has been called, by Dr Hunter, and by other writers, *Pseudo-Elephant*, appear to be nearly of the same size, and weight, whether they are found in Europe, in Asia, or in America. In these three portions of the earth, the animal, to which these exuviæ belonged, was, no doubt, *specifically* the same. See the article MAMMOUTH.

Table II. continued.

EUROPE.	AMERICA.	
		lb.
	Indian pig. Cochon d'Inde	1.6
	Sapajou. Saimiri	1.5
	Phalanger	
	Coquallin	
	Lesser grey squirrel†	1.5
	Black squirrel	1.5
	Red squirrel	10. oz.
	Sagoin Saki	
	Sagoin Pinche	
	Sagoin Tamarin	oz.
	Sagoin Ouistiti	4.4
	Sagoin Marikine	
	Sagoin Mico	
	Cayopollin	
	Fourmillier	
	Marmose	
	Sarigue of Cayenne	
	Tucan	
	Red Mole	oz.
	Ground squirrel	4.

TABLE III. *Domesticated in both.*

	Europe.	America.
	lb.	lb.
Cow	763	*2500
Horse		*1366
Ass		
Hog		*1200
Sheep		*125
Goat		*80
Dog	67.6	
Cat	7.	

71 Result of the first table.

"The result of this view is, that of 26 quadrupeds common to both countries, seven are said to be larger in America, seven of equal size, and 12 not sufficiently examined. So that the first table impeaches the first member of the assertion, that of the animals common to both countries the American are smallest, "Et cela sans aucune exception." It shows it not just, in all the latitude in which its author has advanced it, and probably not to such a degree as to found a distinction between the two countries.

72 Explanation and result of the second table,

"Proceeding to the second table, which arranges the animals found in one of the two countries only, M. de Buffon observes, that the tapir, the elephant of America, is but the size of a small cow." To preserve the comparison, Mr Jefferson states the wild boar, the elephant of Europe, as little more than half that size. He has made an elk, with round or cylindrical horns, an animal of America, and peculiar to it; because he has seen many of them himself, and more of their horns; and because, from the best information, it is certain that, in Virginia, this kind of elk has abounded much, and still exists, in smaller numbers. He makes the American hare, or rabbit, peculiar, because he believes it to be different from both the European animals of those denominations, and calls it, therefore, by its Algonquin name, *Whabus*, to keep it distinct from these. Kalm is of the same opinion. The squirrels are denominated from a knowledge derived from daily sight of them, because with that the European appellations and descriptions seem irreconcilable. These are the only instances in which Mr Jefferson departs from the authority of M. de Buffon, in the construction of this table; whom he takes for his ground-work, because he thinks him the best informed of any naturalist who has ever written. The result is, that there are 18 quadrupeds peculiar to Europe; more than four times as many, to wit, 74, peculiar to America; that the first of these 74, the tapir, the largest of the animals peculiar to America, weighs more than the whole column of Europeans; and consequently this second table disproves the second member of the assertion, that the animals peculiar to the New World are on a smaller scale, so far as that assertion relied on European animals for support: and it is in full opposition to the theory which makes the animal volume to depend on the circumstances of heat and moisture.

73 Of the third table.

The third table comprehends those quadrupeds only which are domestic in both countries. That some of these, in some parts of America, have become less than their original stock, is doubtless true: and the reason is very obvious. In a thinly-peopled country, the spontaneous productions of the forest and waste fields are sufficient to support indifferently the domestic animals of the farmer, with a very little aid from him in the severest and scarcest season. He, therefore, finds it more convenient to receive them from the hand of nature in that indifferent state, than to keep up their size by a care and nourishment which would cost him much labour. If, on this low fare, these animals dwindle, it is no more than they do in those parts of Europe where the poverty of the soil, or poverty of the owner, reduces them to the same scanty subsistence. It is the uniform effect of one and the same cause, whether acting on this or that side of the globe. It would be erring therefore against that principle of philosophy, which teaches us to ascribe like effects to like causes, should we impute this diminution of size in America to any imbecility or want of uniformity in the operations of nature. It may be affirmed, with truth, that in those countries, and with those individuals, of America, where necessity or curiosity has produced equal attention as in Europe to the nourishment of animals, the horses, cattle, sheep, and hogs of the one continent are as large as those of the other. There are particular instances, well attested, where individuals of America have imported good breeders from England, and have improved their size by care, in the course of some years." And the weights actually known and stated in the third table, will suffice to show, that we may conclude, on probable grounds, that with equal food and care, the climate of America will preserve the races of domestic animals as large as the European stock from which they are derived; and, consequently, that the domestic animals are subject to degeneration from the climate of America, is as probably wrong as the first and second are certainly so.

That the last part of it is erroneous, which affirms, that the species of American quadrupeds are comparatively few, is evident from the tables taken altogether; to which may be added the proofs adduced by the Abbé Clavigero. According to Buffon's latest calculation, in his *Epoques de la Nature*, there are 300 species of quadrupeds;

America.

drupeds; and America, though it does not make more than a third part of the globe, contains, according to Clavigero, almost one half of the different species of these animals.

74 The human inhabitants comprehended in the same hypothesis of degeneracy.

Of the human inhabitants of America, to whom the same hypothesis of degeneracy is extended, M. Buffon gives the following description: "Though the American savage be nearly of the same stature with men in polished societies; yet this is not a sufficient exception to the general contraction of animated nature throughout the whole continent. In the savage, the organs of generation are small and feeble. He has no hair, no beard, no ardour for the female. Though nimbler than the European, because more accustomed to running, his strength is not so great. His sensations are less acute; and yet he is more timid and cowardly. He has no vivacity, no activity of mind. The activity of his body is not so much an exercise or spontaneous motion, as a necessary action produced by want. Destroy his appetite for victuals and drink, and you will, at once, annihilate the active principle of all his movements: he remains in stupid repose, on his limbs, or couch, for whole days. It is easy to discover the cause of the scattered life of savages, and of their estrangement from society. They have been refused the most precious spark of Nature's fire: they have no ardour for women, and of course, no love to mankind. Unacquainted with the most lively and the most tender of all attachments, their other sensations of this nature are cold and languid. Their love to parents and children is extremely weak. The bonds of the most intimate of all societies, that of the same family, are feeble; and one family has no attachment to another. Hence no union, no republic, no social state can take place among them. The physical cause of love gives rise to the morality of their manners. Their heart is frozen, their society cold, and their empire cruel. They regard their families as servants destined to labour, or as beasts of burden, whom they load unmercifully with the produce of their hunting, and oblige, without pity or gratitude, to perform labours which often exceed their strength. They have few children, and pay little attention to them. Every thing must be referred to the first cause; they are indifferent because they are weak; and this indifference to the sex is the original stain which disgraces Nature; prevents her from expanding, and by destroying the germs of life, cuts the root of society. Hence, man makes no exception to what has been advanced. Nature, by denying him the faculty of love, has abused and contracted him more than any other animal."

75 Observations by Mr Jefferson.

An humiliating picture, indeed! but than which, Mr Jefferson assures us, never was one more unlike the original. M. Buffon grants, that their stature is the same as that of the men of Europe, and he might have admitted, that the Iroquois were larger, and the Lenopi, or Delawares, taller, than people in Europe generally are. But, he says, their organs of generation are smaller and weaker than those of Europeans: which is not *known*, at least, to be a fact. And as to their want of beard, this error has been already noticed (n°53. *supra*).

76 Seeming coldness of the Americans to the sex accounted for.

"They have no ardour for their females."--It is true, they do not indulge those excesses, nor discover that fondness which are customary in Europe; but this is not owing to a defect in nature, but to manners. The soul of the Indian is wholly bent upon war. This is what procures him glory among the men, and makes him the admiration of the women. To this he is educated, from his earliest youth. When he pursues game with ardour, when he bears the fatigues of the chace, when he sustains and suffers patiently hunger and cold; it is not so much for the sake of the game he pursues, as to convince his parents and the council of the nation, that he is fit to be enrolled in the number of the warriors. The songs of the women, the dance of the warriors, the sage counsel of the chiefs, the tales of the old, the triumphal entry of the warriors returning, with success, from battle, and the respect paid to those who distinguish themselves in battle, and in subduing their enemies; in short, every thing he sees or hears tends to inspire the Indian with an ardent desire for military fame. If a young man were to discover a fondness for women before he has been to war, he would become the contempt of the men, and the scorn and ridicule of the women; or were he to indulge himself with a captive taken in war, and much more were he to offer violence in order to gratify his lust, he would incur indelible disgrace. The seeming frigidity of the American, therefore, is the effect of manners, and not a defect of nature. He is neither more defective in ardour, nor impotent with the female, than a white man reduced to the same diet and exercise.

"They raise few children."—They, indeed, raise fewer children than we do; the causes of which are to be found not in a difference of nature, but of circumstance. The women very frequently attending the men in their parties of war and of hunting, child-bearing becomes extremely inconvenient to them. It is said, therefore, that they have learned the practice of procuring abortion by the use of certain vegetables; and that they even tend to prevent conception for a considerable time after. During these parties they are exposed to numerous hazards, to excessive exertions, to the greatest extremities of hunger. Even at their homes, the nation depends for food, through a certain part of every year, on the gleanings of the forest; that is, they experience a famine once in every year. With all animals, if the female be badly fed, or not fed at all, her young perish; and if both male and female be reduced to like want, generation becomes less active; less productive. To the obstacles, then, of want and hazard, which nature has opposed to the multiplication of wild animals, for the purpose of restraining their numbers within certain bounds, those of labour and of voluntary abortion are added with the Indian. No wonder, then, if they multiply less than we do. Where food is regularly supplied, a single farm will show more of cattle than a whole country of forests can of buffaloes. The same Indian women, when married to white traders, who feed them and their children plentifully and regularly, who exempt them from excessive drudgery, who keep them stationary and unexposed to accident, produce, and raise, as many children as the white women. Instances are known, under these circumstances, of their rearing a dozen children. 77 Why they have few children.

Neither do they seem to be "deficient in natural affection." On the contrary their sensibility is keen, even the warriors weeping most bitterly on the loss of their 78 Of their sensibility &c.

America. their children, though, in general they endeavour to appear superior to human events.

Their friendships are strong, and faithful, to the uttermost extremity. A remarkable instance of this appeared in the case of the late Col. Byrd, of Virginia, who was sent to the Cheerake nation to transact some business with them. It happened that some of our disorderly people had just killed one or two of that nation. It was therefore proposed in the council of the Cheerake, that Col. Byrd should be put to death in revenge for the loss of their countrymen. Among them was a chief called *Silouee*, who on some former occasion, had contracted an acquaintance and friendship with Col. Byrd. He came to him every night, in his tent, and told him not to be afraid, they should not kill him. After many days deliberation, however, the determination was, contrary to Silouee's expectation, that Byrd should be put to death, and some warriors were dispatched as executioners. Silouee attended them; and when they entered the tent, he threw himself between them and Byrd, and said to the warriors, "This man is my friend, before you get at him, you must kill me." On which they returned; and the council respected the principle so much as to recede from their determination.

That "they are timorous and cowardly" is a character with which there is little reason to charge them, when we recollect the manner in which the Iroquois met Monf.———, who marched into their country; in which the old men, who scorned to fly, or to survive the capture of their town, braved death, like the old Romans, in the time of the Gauls, and in which they soon after revenged themselves by sacking and destroying Montreal. In short, the Indian is brave, when an enterprise depends on bravery; education with him making the point of honour to consist in the destruction of an enemy by stratagem, and in the preservation of his own person free from injury; or, perhaps this is nature, while it is education which teaches us to honour force more than finesse. He will defend himself against an host of enemies, always choosing to be killed rather than to surrender, though it be to the whites, who, he knows, will treat him well. In other situations also, he meets death with more deliberation; and endures tortures with a firmness unknown almost to religious enthusiasm among us.

79 Of their courage. (See also n° 59, 60, *supra*.)

Much less are they to be characterized as a people of no vivacity, and who are excited to action or motion only by the calls of hunger and thirst. Their dances, in which they so much delight, and which to a European would be the most severe exercise, fully contradict this; not to mention their fatiguing marches, and the toil they voluntarily and cheerfully undergo in their military expeditions. It is true, that when at home they do not employ themselves in labour or the culture of the soil: but this, again, is the effect of customs and manners which have assigned that to the province of the women. But it is said, "they are averse to society and a social life." Can any thing be more inapplicable than this, to a people who always live in towns, or in clans? Or can they be said to have no *republique*, who conduct all their affairs in national councils; who pride themselves in their national character; who consider an insult or injury, done to an individual by a stranger, as done to the whole, and resent it accordingly?

To form a just estimate of their genius and mental powers, Mr Jefferson observes, more facts are wanting, and great allowance is to be made for those circumstances of their situation which call for a display of particular talents only. This done, we shall probably find that the Americans are formed, in mind as well as in body, on the same model with the *homo sapiens Europæus*. The principles of their society forbidding all compulsion, they are to be led to duty and to enterprise by personal influence and persuasion. Hence eloquence in council, bravery and address in war, become the foundations of all consequence with them. To these acquirements all their faculties are directed. Of their bravery and address in war we have multiplied proofs, because we have been the subjects on which they were exercised. Of their eminence in oratory we have fewer examples, because it is displayed chiefly in their own councils. Some, however, we have of very superior lustre. We may challenge the whole orations of Demosthenes and Cicero, and of any more eminent orator, if Europe has furnished more eminent, to produce a single passage superior to the speech of Logan, a Mingo chief, to Lord Dunmore, when 80 governor of Virginia. The story is as follows; of which Story of and of the speech, the authenticity is unquestionable. Logan. In the spring of the year 1774, a robbery and murder were committed on an inhabitant of the frontiers of Virginia by two Indians, of the Shawanae tribe. The neighbouring whites, according to their custom, undertook to punish this outrage, in a summary way. Colonel Cresap, a man infamous for the many murders he had committed on those much-injured people, collected a party, and proceeded down the Kanhaway, in quest of vengeance. Unfortunately a canoe of women and children, with one man only, was seen coming from the opposite shore, unarmed, and unsuspecting any hostile attack from the whites. Cresap and his party concealed themselves on the bank of the river; and the moment the canoe reached the shore, singled out their objects, and, at one fire, killed every person in it. This happened to be the family of Logan, who had long been distinguished as a friend of the whites. This unworthy return provoked his vengeance. He accordingly signalized himself in the war which ensued. In the autumn of the same year, a decisive battle was fought at the mouth of the Great-Kanhaway, between the collected forces of the Shawanaes, Mingoes, and Delawares, and a detachment of the Virginia militia. The Indians were defeated, and sued for peace. Logan, however, disdained to be seen among the suppliants; but, lest the sincerity of a treaty should be distrusted from which so distinguished a chief absented himself, he sent, by a messenger, the following speech, to be de- 81 livered to Lord Dunmore:—"I appeal to any white Specimen man to say if ever he entered Logan's cabin hungry, of Indian and he gave him not meat; if ever he came cold and eloquence. naked, and he clothed him not. During the course of the last long and bloody war, Logan remained idle in his cabin, an advocate for peace. Such was my love for the whites, that my countrymen pointed as they passed, and said, *Logan is the friend of white men.* I had even thought to have lived with you, but for the injuries of one man. Col. Cresap, the last spring, in cold blood, and unprovoked, murdered all the relations of Logan, not sparing even my women

 and

America.

and children. There runs not a drop of my blood in the veins of any living creature. This called on me for revenge. I have sought it; I have killed many; I have fully glutted my vengeance. For my country, I rejoice at the beams of peace; but do not harbour a thought that mine is the joy of fear. Logan never felt fear. He will not turn on his heel to save his life. Who is there to mourn for Logan? Not one."

82 Other anecdotes.

To the preceding anecdotes, in favour of the American character, may be added the following, by Dr Benjamin Franklin.—The Indian men, when young, are hunters and warriors; when old, counsellors; for all their government is by the counsel or advice of the sages. Hence, they generally study oratory; the best speakers having the most influence. The Indian women till the ground, dress the food, nurse and bring up the children, and preserve and hand down to posterity the memory of public transactions. These employments of men and women are accounted natural and honourable. Having few artificial wants, they have abundance of leisure for improvement by conversation. Our laborious manner of life, compared with theirs, they esteem slavish and base; and the learning on which we value ourselves, they regard as frivolous and useless.

Having frequent occasions to hold public councils, they have acquired great order and decency in conducting them. The old men sit in the foremost rank, the warriors in the next, and the women and children in the hindmost. The business of the women is to take exact notice of what passes; imprint it in their memories, for they have no writing, and communicate it to their children. They are the records of the council, and they preserve tradition of the stipulations in treaties a hundred years back; which, when we compare with our writings, we always find exact. He that would speak, rises. The rest observe a profound silence. When he has finished, and sits down, they leave him five or six minutes to recollect, that if he has omitted any thing he intended to say, or has any thing to add, he may rise again and deliver it. To interrupt another, even in common conversation, is reckoned highly indecent.

83 Politeness and civility of the American Indians.

The politeness of these savages in conversation is, indeed, carried to excess; since it does not permit them to contradict, or deny, the truth of what is asserted in their presence. By these means they, indeed avoid disputes; but then it becomes difficult to know their minds, or what impression you make upon them. The missionaries, who have attempted to convert them to Christianity, all complain of this, as one of the great difficulties of their mission. The Indians, hear, with patience, the truths of the gospel explained to them, and give their usual tokens of assent and approbation; but this by no means implies conviction: it is mere civility. When any of them come into our towns, our people are apt to croud round them, gaze upon them, and incommode them when they desire to be private; this they esteem great rudeness, and the effect of the want of instruction in the rules of civility and good manners. "We have," they say, "as much curiosity as you; and when you come into our towns, we wish for opportunities of looking at you; but for this purpose we hide ourselves behind bushes where you are to pass, and never intrude ourselves into your company."

Their manner of entering one another's villages has likewise its rules. It is reckoned uncivil in travelling strangers to enter a village abruptly, without giving notice of their approach. Therefore, as soon as they arrive within hearing, they stop and hollow, remaining there till invited to enter. Two old men usually come out to them, and lead them in. There is in every village a vacant dwelling, called the *strangers-house*. Here they are placed, while the old men go round from hut to hut, acquainting the inhabitants that strangers are arrived, who are, probably, hungry and weary; and every one sends them what he can spare of victuals, and skins to repose on. When the strangers are refreshed, pipes and tobacco are brought; and then, but not before, conversation begins, with inquiries who they are, whither bound, what news, &c. and it usually ends with offers of service; if the strangers have occasion for guides, or any necessaries, for continuing their journey; and nothing is exacted for the entertainment.

America. 84 Their hospitality.

The same hospitality, esteemed among them as a principal virtue, is practised by private persons; of which Conrad Weiser, a celebrated interpreter of the Indian languages, gave Dr Franklin the following instance. He had been naturalized among the Six Nations, and spoke well the Mohock language. In going through the Indian country, to carry a message from our governor to the council at Onondaga, he called at the habitation of Canassetego, an old acquaintance, who embraced him, spread furs for him to sit on, placed before him some boiled beans and venison, and mixed some rum and water for his drink. When he was well refreshed, and had lit his pipe, Canassetego began to converse with him: asked how he had fared the many years since they had seen each other, whence he then came, what had occasioned the journey, &c. Conrad answered all his questions; and when the discourse began to flag, the Indian, to continue it said, "Conrad, you have lived long among the white people, and know something of their customs: I have been sometimes at Albany, and have observed that once in seven days they shut up their shops, and assemble all in the great house; tell me what it is for?—What do they do there?" "They meet there," says Conrad, "to hear and learn *good things*." "I do not doubt," says the Indian, "that they tell you so; they have told me the same: but I doubt the truth of what they say, and I will tell you my reasons. I went lately to Albany to sell my skins, and buy blankets, knives, powder, rum, &c. You know I used generally to deal with Hans Hanson; but I was a little inclined, at this time to try some other merchants. However, I called first upon Hans, and asked him what he would give for beaver. He said he could not give more than 4s. a pound; but (says he) I cannot talk on business now; this is the day when we meet together to learn *good things*, and I am going to the meeting. So, I thought to myself, since I cannot do any business to-day, I may as well go to the meeting too; and I went with him.—There stood up a man in black, and began to talk to the people, very angrily. I did not understand what he said; but perceiving that he looked much at me and Hanson, I imagined he was angry at seeing me there; so I went out, sat down near the house, struck fire, and lit my pipe, waiting till the meeting should break up. I thought too, that the man had mentioned something of of beaver, and I ſuſpected that it might be the ſubject of their meeting. So when they came out, I accoſted my merchant.—Well, Hans, (ſays I) I hope you have agreed to give more than 4s. a pound?" "No, (ſays he) I cannot give ſo much, I cannot give more than 3s.6d." "I then ſpoke to ſeveral other dealers, but they all ſung the ſame ſong, three and ſix-pence, three and ſix-pence. This made it clear to me that my ſuſpicion was right: and that whatever they pretended of meeting to learn *good things*, the real purpoſe was, to conſult how to cheat Indians in the price of beaver. Conſider but a little, Conrad, and you muſt be of my opinion. If they met ſo often to learn *good things*, they certainly would have learned ſome before this time. But they are ſtill ignorant. You know our practice. If a white man, in travelling through our country, enters one of our cabins, we all treat him as I treat you; we dry him if he is wet, we warm him if he is cold, and give him meat and drink, that he may allay his thirſt and hunger; and we ſpread ſoft furs for him to reſt and ſleep on: we demand nothing in return. But if I go into a white-man's houſe at Albany, and aſk for victuals and drink, they ſay, Where is your money? And if I have none, they ſay, Get out, you Indian dog. You ſee they have not yet learned thoſe little *good things* that we need no meeting to be inſtructed in; becauſe our mothers taught them to us when we were children; and, therefore, it is impoſſible their meetings ſhould be, as they ſay, for any ſuch purpoſe, or have any ſuch effect; they are only to contrive *the cheating of Indians in the price of beaver.*"

The next queſtion which offers itſelf to our notice, is, Whether the peculiarities of the *aboriginal Americans*, or the diſparity between them and the inhabitants of the Old-World, afford ſufficient grounds for determining *them*, as many eminent writers have done, to be a *race of men radically different from all others?*

In this queſtion, to avoid being tedious, we ſhall confine ourſelves to what has been advanced by Lord Kames; who is of opinion, that there are many different ſpecies of men, as well as of other animals; and gives an hypotheſis, whereby he pretends his opinion may be maintained in a conſiſtency with Revelation.

85 Lord Kames's arguments for different ſpecies.

"If (ſays he) the only rule afforded by nature for claſſing animals can be depended on, there are different races of men as well as of dogs: a maſtiff differs not more from a ſpaniel, than a white man from a negro, or a Laplander from a Dane. And, if we have any faith in Providence, it ought to be ſo. Plants were created of different kinds, to fit them for different climates; and ſo were brute animals. Certain it is, that all men are not fitted equally for every climate. There is ſcarce a climate but what is natural to ſome men, where they proſper and flouriſh: and there is not a climate, but where ſome men degenerate. Doth not then analogy lead us to conclude, that, as there are different climates on the face of this globe, ſo there are different races of men fitted for theſe different climates?

"M. Buffon, from the rule, That animals which can procreate together; and whoſe progeny can alſo procreate, are of one ſpecies; concludes, that all men are of one race or ſpecies; and endeavours to ſupport that favourite opinion, by aſcribing to the climate, to food, or to other accidental cauſes, all the varieties that are found among men. But is he ſeriouſly of opinion, that any operation of climate, or of other accidental cauſe, can account for the copper colour and ſmooth chin univerſal among the Americans; the prominence of the pudenda univerſal among the Hottentot women, or the black nipple no leſs univerſal among the female Samoiedes?—It is in vain to aſcribe to the climate, the low ſtature of the Eſquimaux, the ſmallneſs of their feet, the overgrown ſize of their heads. It is equally in vain to aſcribe to climate the low ſtature of the Laplanders, or their ugly viſage. The black colour of negroes, thick lips, flat noſe, criſped woolly hair, and rank ſmell, diſtinguiſh them from every other race of men. The Abyſſinians, on the contrary, are tall and well made, their complexion a brown olive, features well-proportioned, eyes large and of a ſparkling black, thin lips, a noſe rather high than flat. There is no ſuch difference of climate between Abyſſinia and Negro-land as to produce theſe ſtriking differences.

"Nor ſhall our author's ingenious hypotheſis concerning the extremities of heat and cold, purchaſe him impunity with reſpect to the ſallow complexion of the Samoiedes, Laplanders, and Greenlanders. The Finlanders, and northern Norwegians, live in a climate not leſs cold than that of the people mentioned; and yet are fair beyond other Europeans. I ſay, more, there are many inſtances of races of people preſerving their original colour, in climates very different from their own; but not a ſingle inſtance of the contrary, as far as I can learn. There have been four complete generations of negroes in Pennſylvania, without any viſible change of colour; they continue jet black, as originally. Thoſe who aſcribe all to the ſun: ought to conſider how little probable it is, that the colour it impreſſes on the parents ſhould be communicated to their infant children who never ſaw the ſun: I ſhould be as ſoon induced to believe, with a German naturaliſt, whoſe name has eſcaped me, that the negro colour is owing to an ancient cuſtom in Africa, of dyeing the ſkin black. Let a European, for years, expoſe himſelf to the ſun, in a hot climate, till he be quite brown; the children will, nevertheleſs, have the ſame complexion with thoſe in Europe. From the action of the ſun, is it poſſible to explain, why a negro, like a European, is born with a ruddy ſkin, which turns jet black, the eighth, or ninth, day?"

Our author next proceeds to draw ſome arguments for the exiſtence of different races of men, from the various tempers and diſpoſitions of different nations; which he reckons to be *ſpecific* differences, as well as thoſe of colour, ſtature, &c. and having ſummed up his evidence, he concludes thus: "Upon ſumming up the whole particulars, mentioned above, would one heſitate a moment, to adopt the following opinion, were there no counterbalancing evidence, viz. 'That God 'created many pairs of the human race, differing 'from each other, both externally and internally; that 'he fitted thoſe pairs for different climates, and placed 'each pair in its proper climate; that the peculi'arities of the original pairs were preſerved entire 'in their deſcendants; who, having no aſſiſtance but 'their natural talents, were left to gather knowledge 'from experience; and, in particular, was left (each 'tribe) to form a languge for itſelf; that ſigns were

America. 'ſufficient for the original pairs, without any language 'but what nature ſuggeſts; and that a language was 'formed gradually, as a tribe increaſed in numbers, 'and in different occupations, to make ſpeech neceſ-'ſary?" But this opinion, however plauſible, we are not permitted to adopt; being taught a different leſſon by Revelation, viz. That God created but a ſingle pair of the human ſpecies. Though we cannot doubt the authority of Moſes, yet his account of the creation of man is not a little puzzling, as it ſeems to contradict every one of the facts mentioned above. According to that account, different races of men were not formed, nor were men formed originally for different climates. All men muſt have ſpoken the ſame language, viz. That of our firſt parents. And what of all ſeems the moſt contradictory to that account, is the ſavage ſtate: Adam, as Moſes informs us, was endued by his Maker with an eminent degree of knowledge; and he certainly was an excellent preceptor to his children and their progeny, among whom he lived many generations. Whence then the degeneracy of all men

86 His hypotheſis concerning the origin of the different ſpecies.

unto the ſavage ſtate? To account for that diſmal cataſtrophe, mankind muſt have ſuffered ſome terrible convulſion. That terrible convulſion is revealed to us in the hiſtory of the tower of Babel, contained in the 11th chapter of Geneſis, which is, 'That, for many 'centuries after the deluge, the whole earth was of one 'language, and of one ſpeech; that they united to 'build a city on the plain in the land of Shinar, with a 'tower whoſe top might reach unto heaven; that the 'Lord, beholding the people to be one, and to have 'all one language, and that nothing would be re-'ſtrained from them which they imagined to do, con-'founded their language, that they might not under-'ſtand one another, and ſcattered them abroad upon 'the face of the earth.' Here, light breaks forth in the midſt of all darkneſs. By confounding the language of men, and ſcattering them abroad upon the face of all the earth, they were rendered ſavages. And to harden them for their new habitations, it was neceſſary that they ſhould be divided into different kinds, fitted for different climates. Without an immediate change of conſtitution, the builders of Babel could not poſſibly have ſubſiſted in the burning region of Guinea, nor in the frozen region of Lapland; houſes not being prepared, nor any other convenience to protect them againſt a deſtructive climate."

87 Incomplete.

We may, firſt, remark on his lordſhip's hypotheſis, that it is evidently incomplete: for, allowing the human race to have been divided into different ſpecies, at the confuſion of languages, and that each ſpecies was adapted to a particular climate: by what means were they to get to the climates proper for them, or how were they to know that ſuch climates exiſted? How was an American, for inſtance, when languiſhing in an improper climate at Bable, to get to the land of the Amazons, or, the banks of the Oroonoko, in his own country? Or how was he to know that theſe places were more proper for him than others?—If, indeed, we take the ſcripture phraſe, "The Lord *ſcattered them abroad* upon the face of all the earth," in a certain ſenſe, we may account for it. If we ſuppoſe that the different ſpecies were immediately carried off by a whirlwind, or other ſupernatural means, to their proper coun ries, the difficulty will vaniſh: but if this is his Lordſhip's interpretation, it is certainly a very ſingular one. America.

88 General principles to be kept in view in reaſoning on this ſubject.

Before entering upon the conſideration of the particular arguments uſed by our author for proving the diverſity of ſpecies in the human race, it will be proper to lay down the following general principles, which may ſerve as axioms. (1). When we aſſert a multiplicity of ſpecies in the human race; we bring in a ſupernatural cauſe to ſolve a natural phenomenon; for theſe ſpecies are ſuppoſed to be the immediate work of the Deity. (2). No perſon has a right to call any thing the immediate effect of omnipotence, unleſs by expreſs revelation from the Deity, or from a certainty that no natural cauſe is ſufficient to produce the effect. The reaſon is plain. The Deity is inviſible, and there are many natural cauſes: when we ſee an effect, therefore, of which the cauſe does not manifeſt itſelf, we cannot know whether the immediate cauſe is the Deity, or an inviſible natural power. An example of this we have in the phenomena of thunder and earthquakes, which were often aſcribed immediately to the Deity, but are now diſcovered to be the effects of electricity. (3). No perſon can aſſert natural cauſes to be inſufficient to produce ſuch and ſuch effects, unleſs he perfectly knows all theſe cauſes, and the limits of their power in all poſſible caſes; and this no man has ever known, or can know.

By keeping in view theſe principles, which we hope are ſelf-evident, we will eaſily ſee lord Kame's arguments to conſiſt entirely in a *petitio principii*.—In ſubſtance, they are all reduced to this ſingle ſentence: "Natural philoſophers have been, hitherto, unſucceſsful in their endeavours to account for the differences obſerved among mankind, therefore theſe differences cannot be accounted for from natural cauſes."

89 Inconſiſtency in Lord Kames's arguments.

His Lordſhip, however, tells us in the paſſages already quoted, that "a maſtiff differs not more from a ſpaniel, than a Laplander from a Dane;" that "it is vain to aſcribe to climate the low ſtature of the Laplanders, or their ugly viſage.—Yet, in a note on the word *Laplanders*, he ſubjoins, that, "by late accounts it appears, that the Laplanders are only degenerated Tartars, and that they and the Hungarians originally ſprung from the ſame breed of men, and from the ſame country."—The Hungarians are generally handſome and well-made, like Danes, or like other people. The Laplanders, he tells us, differ as much from them as a maſtiff from a ſpaniel. Natural cauſes, therefore, according to Lord Kames himſelf, may cauſe two individuals of the ſame ſpecies of mankind differ from each other as much as a maſtiff does from a ſpaniel.

90 Remarkable difference of colour from accidental cauſes.

While we are treating this ſubject of colour, it may not be amiſs to obſerve, that a very remarkable difference of colour may accidentally happen to individuals of the ſame ſpecies. In the iſthmus of Darien, a ſingular race of men have been diſcovered.—They are of low ſtature, of a feeble make, and incapable of enduring fatigue. Their colour is a dead milk white; not reſembling that of fair people among Europeans, but without any bluſh or ſanguine complexion. Their ſkin is covered with a fine hairy down of a chalky white; the hair of their heads, their eye-brows, and eye-laſhes, are of the ſame hue. Their eyes are of a ſingular form, and ſo weak, that they can hardly bear the light

of

of the ſun; but they ſee clearly by moon-light, and are moſt active and gay in the night. Among the negroes of Africa, as well as the natives of the Indian iſlands, a ſmall number of thoſe people are produced. They are called *Albinos* by the Portugueſe, and *Kackerlakes* by the Dutch.

91 Colour no characteriſtic of a different ſpecies.

This race of men is not indeed permanent; but it is ſufficient to ſhow, that mere *colour* is by no means the characteriſtic of a certain ſpecies of mankind. The difference of colour in theſe individuals is undoubtedly owing to a natural cauſe. To conſtitute, then, a race of men of this colour, it would only be neceſſary that this cauſe, which at preſent is merely accidental, ſhould become permanent, and we cannot know but it may be ſo in ſome parts of the world.

92 Nor ſtature.

If a difference of colour is no characteriſtic of a different ſpecies of mankind, much leſs can a difference in ſtature be thought ſo. In the ſouthern parts of America, there are ſaid to be a race of men exceeding the common ſize in height and ſtrength*. This account, however, is doubted of by ſome; but be that as it will, it is certain that the Eſquimaux are as much under the common ſize, as the Patagonians are ſaid to be above it. Nevertheleſs, we are not to imagine, that either of theſe are ſpecific differences; ſeeing the Laplanders and Hungarians are both of the ſame ſpecies, and yet the former are generally almoſt a foot ſhorter than the latter; and if a difference of climate, or other accidental cauſes, can make the people of one country a foot ſhorter than the common ſize of mankind, undoubtedly accidental cauſes of a contrary nature may make thoſe of another country a foot taller than other men.

* See *Patagonia*.

93 Different cauſes contribute towards an alteration in colour.

Though the ſun has, moſt undoubtedly, a ſhare in the production of the ſwarthy colour of thoſe nations which are expoſed to its influence; yet the manner of living to which people are accuſtomed; their food, their employment, and many other circumſtances, muſt alſo contribute, not a little, to a difference of complexion. The more full examination, however, of theſe ſeveral circumſtances we reſerve for another article. See the article Complexion.

94 Habit capable of altering the inſtinct of animals.

It is allowed on all hands, that it is more eaſy to work a change upon the body of a man, or any other animal, than upon his mind. A man who is naturally choleric, may, indeed, learn to prevent the bad effects of his paſſion by reaſon, but the paſſion itſelf will remain as immutable as his colour.—But, to reaſon in a manner ſimilar to Lord Kames; though a man ſhould be naturally choleric, or ſubject to any other paſſion, why ſhould his children be ſo?—This way of reaſoning, however plauſible, is by no means concluſive, as will appear from the following paſſage in Mr Forſter's Voyage.

Voyage round the World, Vol. I. p. 234.

June 9th. "The officers who could not yet reliſh their ſalt proviſions after the refreſhments of New-Zealand, had ordered their black dog, mentioned p. 135, to be killed: this day, therefore, we dined, for the firſt time, on a leg of it roaſted; which taſted ſo exactly like mutton, that is was abſolutely undiſtinguiſhable. In our cold countries, where animal food is ſo much uſed, and where to be carnivorous, perhaps, lies in the nature of men, or is indiſpenſably neceſſary to the preſervation of their health and ſtrength, it is ſtrange that there ſhould exiſt a Jewiſh averſion to dogs-fleſh, when hogs, the moſt uncleanly of all animals, are eaten without ſcruple. Nature ſeems expreſsly to have intended them for this uſe, by making their offspring ſo very numerous, and their increaſe ſo quick, and frequent. It may be objected, that the exalted degree of inſtinct which we obſerve in our dogs, inſpires us with great unwillingneſs to kill and eat them. But it is owing to the time we ſpend on the education of dogs, that they acquire thoſe eminent qualities, which attach them ſo much to us. The natural qualities of our dogs may receive a wonderful improvement; but education muſt give its aſſiſtance, without which the human mind itſelf, though capable of an immenſe expanſion, remains in a very contracted ſtate. In New-Zealand, and (according to former accounts of voyages) in the tropical iſles of the South-Sea, the dogs are the moſt ſtupid, dull animals imaginable, and do not ſeem to have the leaſt advantage in point of ſagacity over our ſheep, which are commonly made the emblems of ſillineſs. In the former country they are fed upon fiſh, in the latter on vegetables, and both theſe diets may have ſerved to alter their diſpoſition. Education may, perhaps, likewiſe, graft new inſtincts: the New-Zealand dogs are fed on the remains of their maſters meals; they eat the bones of other dogs; and the puppies become true cannibals from their birth. We had a young New-Zealand puppy on board, which had certainly had no opportunity of taſting any thing but the mother's milk before we purchaſed it; however, it eagerly devoured a portion of the fleſh and bones of the dog on which we dined to-day; while ſeveral others of the European breed, taken on board at the Cape, turned from it without touching it.

Ibid. p. 243.

"On the 4th of Auguſt, a young bitch, of the terrier breed, taken on board at the Cape of Good-Hope, and covered by a ſpaniel, brought ten young ones, one of which was dead. The New-Zealand dog mentioned above, which devoured the bones of the roaſted dog, now fell upon the dead puppy, and eat of it with a ravenous appetite. This is a proof how far education may go in producing, and propagating, new inſtincts in animals. European dogs are never fed on the meat of their own ſpecies, but rather ſeem to abhor it. The New-Zealand dogs, in all likelihood, are trained up from their earlieſt age, to eat the remains of their maſter's meals: they are, therefore, uſed to feed upon fiſh; their own ſpecies; and, perhaps, human fleſh; and what was only owing to a habit, at firſt, may have become inſtinct, by length of time. This was remarkable in our cannibal dog; for he came on board ſo young, that he could not have been weaned long enough to have acquired a habit of devouring his own ſpecies, and much leſs of eating human fleſh; however, one of our ſeamen having cut his finger, held it out to the dog, who fell to greedily, licked it, and then began to bite it."

From this account it appears, that even the inſtincts of animals are not unchangeable by natural cauſes; and if theſe cauſes are powerful enough to change the diſpoſitions of ſucceeding generations, much more may we ſuppoſe them capable of making any poſſible alteration in the external appearance.

95 Confirmed by an obſervation on the Franks

We are not here neceſſitated to confine ourſelves to obſervations made on brute animals. The Franks are an example of the production of one general character, formed by ſome natural cauſe from a mixture of many different

America.

different nations.—They were a motley multitude, consisting of various German nations dwelling beyond the Rhine; who, uniting in defence of their common liberty, took thence the name of *Franks;* the word *frank* signifying in their language, as it still does in ours, *free*. Among them the following nations were mentioned, viz. the Actuarii, Chamavi, Bructeri, Salii, Frisii, Chausi, Amswarii, and Catti. We cannot suppose one character to belong to so many different nations; yet is it certain that the Franks were, nationally, characterized as treacherous. It is in vain, then, to talk of different races of men, either from their colour, size, or prevailing dispositions, seeing we have undeniable proofs that all these may be changed, in the most remarkable manner, by natural causes, without any miraculous interposition of the Deity.

96
Of the peopling of America.

The questions which now present themselves to our notice are, From what part of the Old-World America has, most probably, been peopled?—And how was this peopling accomplished?—

Few *questions* in the history of mankind have been more agitated than these.—Philosophers, and men of learning and ingenuity, have been speculating upon *them*, ever since the discovery of the American-Islands, by Christopher Columbus.—But notwithstanding all the labours of Acosta, of Grotius, and of many other writers of eminence, the subject still affords an ample field for the researches of the man of science, and for the fancies of the theorist.

Discoveries, long ago made, inform us, that an intercourse between the Old-Continent and America might be carried on, with facility, from the north-west extremities of Europe and the north-east boundaries of Asia. In the ninth century the Norwegians discovered Greenland, and planted a colony there. The communication with that country, was renewed in the last century by Moravian missionaries, in order to propagate their doctrine in that bleak and uncultivated region. By them we are informed that the north-west coast of Greenland is separated from America by a very narrow strait; that at the bottom of the bay it is highly probable that they are united; that the Esquimaux of America perfectly resemble the Greenlanders, in their aspect, dress, and mode of living; and that a Moravian missionary, well acquainted with the language of Greenland, having visited the country of the Esquimaux, found, to his astonishment, that they spoke the same language with the Greenlanders, and were, in every respect, the same people. The same species of animals, too, are found in the contiguous regions. The bear, the wolf, the fox, the hare, the deer, the roebuck, the elk, frequent the forests of North-America, as well as those in the north of Europe.

97
A communication between the Old and New-Continents, by two ways.

Other discoveries have proved, that if the two continents of Asia and America be separated at all, it is only by a narrow strait. From this part of the Old-Continent, also, inhabitants may have passed into the New; and the resemblance between the Indians of America and the eastern inhabitants of Asia, would induce us to conjecture that they have a common origin. This is the opinion adopted by Dr Robertson, in his History of America*, where we find it accompanied with the following narrative.

* History of America, Vol. II. p. 273.

"While those immense regions which stretched eastward from the river Oby to the sea of Kamtschatka were unknown, or imperfectly explored, the north-east extremities of our hemisphere were supposed to be so far distant from any part of the New-world, that it was not easy to conceive how any communication should have been carried on between them. But the Russians, having subjected the western part of Siberia to their empire, gradually extended their knowledge of that vast country, by advancing towards the east into unknown provinces. These were discovered by hunters in their excursions after game, or by soldiers employed in levying the taxes; and the court of Muscow estimated the importance of those countries only by the small addition which they made to its revenue. At length, Peter the Great, ascended the Russian throne: His enlightened, comprehensive mind, intent upon every circumstance that could aggrandize his empire, or render his reign illustrious, discerned consequences of those discoveries, which had escaped the observation of his ignorant predecessors. He perceived, that, in proportion as the regions of Asia extended towards the east, they must approach nearer to America; that the communication between the two continents, which had long been searched for in vain, would probably be found in this quarter; and that, by opening this intercourse, some part of the wealth and commerce of the western world might be made to flow into his dominions by a new channel. Such an object suited a genius that delighted in grand schemes. Peter drew up instructions with his own hand for prosecuting this design, and gave orders for carrying it into execution.

"His successors adopted his ideas, and pursued his plan. The officers whom the Russian court employed in this service, had to struggle with so many difficulties, that their progress was extremely slow. Encouraged by some faint traditions among the people of Siberia concerning a successful voyage in the year 1648 round the north-east promontory of Asia, they attempted to follow the same course. Vessels were fitted out, with this view, at different times, from the rivers Lena and Kolyma; but in a frozen ocean, which nature seems not to have destined for navigation, they were exposed to many disasters, without being able to accomplish their purpose. No vessel fitted out by the Russian court ever doubled this formidable cape; we are indebted for what is known of those extreme regions of Asia, to the discoveries made in excursions by land. In all those provinces, an opinion prevails, that countries of great extent and fertility lie at no considerable distance from their own coasts. These the Russians imagined to be part of America; and several circumstances occurred not only in confirming them in this belief, but in persuading them that some portion of that continent could not be very remote. Trees of various kinds, unknown in those naked regions of Asia, are driven upon the coast by an easterly wind. By the same wind floating ice is brought thither in a few days; flights of birds arrive annually from the same quarter; and a tradition obtains among the inhabitants, of an intercourse formerly carried on with some countries situated to the east.

"After weighing all these particulars, and comparing the position of the countries in Asia which they had discovered, with such parts in the north-west of America as were already known; the Russian court formed

America.

ed a plan, which would have hardly occurred to any nation less accustomed to engage in arduous undertakings, and to contend with great difficulties. Orders were issued to build two vessels at Ochotz, in the sea of Kamtschatka, to sail on a voyage of discovery. Though that dreary uncultivated region furnished nothing that could be of use in constructing them but some larch-trees; though not only the iron, the cordage, the sails, and all the numerous articles requisite for their equipment, but the provisions for victualling them, were to be carried through the immense desarts of Siberia, along rivers of difficult navigation, and roads almost impassable, the mandate of the sovereign, and the perseverance of the people, at last surmounted every obstacle. Two vessels were finished; and, under the command of captains Behring and Tschirikow, sailed from Kamtschatka in quest of the New-World, in a quarter where it had never been approached. They shaped their course towards the east; and though a storm soon separated the vessels, which never rejoined, and many disasters befel them, the expectations from the voyage were not altogether frustrated. Each of the commanders discovered land, which to them appeared to be part of the American continent; and, according to their observations, it seems to be situated within a few degrees of the north-west coast of California. Each set some of his people ashore: but in one place the inhabitants fled as the Russians approached; in another, they carried off those who landed, and destroyed their boats. The violence of the weather, and the distress of their crews, obliged both to quit this inhospitable coast. In their return they touched at several islands, which stretch in a chain from east to west between the country which they had discovered and the coast of Asia. They had some intercourse with the natives, who seemed to them to resemble the North-Americans. They presented to the Russians the calumet, or pipe of peace, which is a symbol of friendship universal among the people of North-America, and an usage of arbitrary institution peculiar to them."

98 Reason for supposing the two continents to have been once joined.

The more recent and accurate discoveries of that illustrious navigator Cooke, and of his successor Clerke, have brought the matter still nearer to certainty. The sea, from the south of Behring's Straits to the crescent of isles between Asia and America, is very shallow. It deepens from these straits (as the British seas do from those of Dover) till soundings are lost in the Pacific-Ocean; but that does not take place but to the south of the isles. Between them and the straits is an increase from 12 to 54 fathoms, except only off St Thaddeus-Noss, where there is a channel of greater depth. From the volcanic disposition, it has been judged probable, not only that there was a separation of the continents at the straits of Behring, but that the whole space from the isles to that small opening had once been occupied by land; and that the fury of the watery element, actuated by that of fire, had, in most remote times, subverted and overwhelmed the tract, and left the islands to serve as monumental fragments.

99 Probable cause of their subsequent separation.

Without adopting all the fancies of Buffon, there can be no doubt, as the Abbe Clavigero observes, that our planet has been subject to great vicissitudes since the deluge. Ancient and modern histories confirm the truth which Ovid has sung in the name of Pythagoras:

Vidi ego quod fuerat quondam solidissima tellus,
Esse fretum; vidi fractas ex æquore terras.

At present, they plough those lands, over which ships formerly sailed, and now they sail over lands which were, formerly, cultivated: earthquakes have swallowed some lands, and subterraneous fires have thrown up others: the rivers have formed new soil with their mud: the sea, retreating from the shores, has lengthened the land in some places, and advancing in others has diminished it; it has separated some territories which were formerly united, and formed new straits and gulphs. We have examples of all these revolutions in the past century. Sicily was united to the continent of Naples, as Eubea, now the Black-Sea, was to Bœotia. Diodorus, Strabo, and other ancient authors, say the same thing of Spain, and of Africa, and affirm, that by a violent eruption of the ocean upon the land between the mountains Abyla and Calpe, that communication was broken, and the Mediterranean-Sea was formed. Among the people of Ceylon there is a tradition that a similar eruption of the sea separated their island from the peninsula of India. The same thing is believed by those of Malabar with respect to the isles of Maldivia, and with the Malayans with respect to Sumatra. It is certain, says the count de Buffon, that in Ceylon the earth has lost 30 or 40 leagues, which the sea has taken from it; on the contrary, Tongres, a place of the Low-Countries, has gained 30 leagues of land from the sea. The northern part of Egypt owes its existence to inundations of the Nile. The earth which this river has brought from the inland countries of Africa, and deposited in its inundations, has formed a soil of more than 25 cubits of depth. In like manner, adds the above author, the province of the Yellow-River in China, and that of Louisiana, have only been formed of the mud of rivers. Pliny, Seneca, Diodorus, and Strabo, report innumerable examples of similar revolutions, which we omit, that our dissertation may not become too prolix; as also many modern revolutions, which are related in the theory of the earth of the Count de Buffon and other authors. In South-America, all those who have observed with philosophic eyes the peninsula of Yucatan, do not doubt that that country has once been the bed of the sea; and, on the contrary, in the channel of Bahama, many indications show the island of Cuba to have been once united to the continent of Florida. In the strait which separates America from Asia many islands are found, which probably were the mountains belonging to that tract of land which we suppose to have been swallowed up by earthquakes; which is made more probable by the multitude of volcanoes which we know of in the peninsula of Kamtschatka. It is imagined, however, that the sinking of that land, and the separation of the two continents, has been occasioned by those great and extraordinary earthquakes mentioned in the histories of the Americans, which formed an æra almost as memorable as that of the deluge. The histories of the Toltecas fix such earthquakes in the year I Tecpatl; but as we know not to what century that belonged, we can form no conjecture of the time that great calamity happened. If a great earthquake should overwhelm the isthmus of Seuz, and there should be at the same time as great a scarcity of historians as there were in the first ages after

America.

after the deluge, it would be doubted, in 300 or 400 years after, whether Asia had ever been united by that part to Africa; and many would firmly deny it.

100 Separated only by a narrow strait.

Whether that great event, the separation of the continents, took place before or after the population of America, it is impossible for us to determine: but we are indebted to the abovementioned navigators for settling the long dispute about the point from which it was effected. Their observations prove, that in one place the distance between continent and continent is only 39 miles, not (as the author of the *Recherches Philosophiques sur les Americains* would have it) 800 leagues. This narrow strait has also in the middle two islands, which would greatly facilitate the migration of the Asiatics into the New-World, supposing that it took place in canoes after the convulsion which rent the two continents asunder. Besides, it may be added, that these straits are, even in the summer, often filled with ice; in winter, often frozen. In either case, mankind might find an easy passage; in the last, the way was extremely ready for quadrupeds to cross and stock the continent of America. But where, from the vast expanse of the north-eastern world, to fix on the first tribes who contributed to people the New-Continent, now inhabited almost from end to end, is a matter that baffles human reason. The learned may make bold and ingenious conjectures, but plain good sense cannot always accede to them.

101 Easiness of the passage between them.

102 Conjectures concerning the first migrations into the New-Continent.

As mankind increased in numbers, they naturally protruded one another forward. Wars might be another cause of migrations. There appears no reason why the Asiatic north might not be an *officina virorum*, as well as the European. The overteeming country, to the east of the Riphæan Mountains, must find it necessary to discharge its inhabitants: the first great wave of people was forced forward by the next to it, more tumid and more powerful than itself: successive and new impulses continually arriving, short rest was given to that which spread over a more eastern tract; disturbed again and again, it covered fresh regions; at length, reaching the farthest limits of the Old-World, found a new one, with ample space to occupy unmolested for ages; till Columbus cursed them by a discovery, which brought again new sins and new deaths to both worlds.

103 Mr Pennant's opinion.

"The inhabitants of the New-World (Mr Pennant observes), do not consist of the offspring of a single nation: different people, at several periods, arrived there, and it is impossible to say, that any one is now to be found on the original spot of its colonization. It is impossible, with the lights which we have so recently received, to admit that America could receive its inhabitants (at least the bulk of them) from any other place than Eastern-Asia. A few proofs may be added, taken from customs or dresses common to the inhabitants of both worlds: some have been long extinct in the old, others remain in both in full force.

104 The bulk of its inhabitants probably first received from the eastern part of Asia.

"The custom of scalping was a barbarism in use with the Scythians, who carried about them, at all times, this savage mark of triumph: they cut a circle round the neck, and stripped off the skin, as they would that of an ox. A little image, found among the Kalmucs, of a Tartarian deity, mounted on a horse, and sitting on a human skin, with scalps pendant from the breast, fully illustrates the custom of the Scythian progenitors, as described by the Greek historian. This usage, as we well know, by horrid experience, is continued to this day in America. The ferocity of the Scythians to their prisoners extended to the remotest part of Asia. The Kamtschatkans, even at the time of their discovery by the Russians, put their prisoners to death by the most lingering and excruciating inventions; a practice in full force to this very day among the aboriginal Americans. A race of the Scythians were styled *Anthropophagi*, from their feeding on human flesh. The people of Nootka Sound still make a repast on their fellow-creatures; but what is more wonderful, the savage allies of the British army have been known to throw the mangled limbs of the French prisoners into the horrible cauldron, and devour them with the same relish as those of a quadruped.

105 Proofs from a similarity of customs, &c.

"The Scythians were said, for a certain time, annually to transform themselves into wolves, and again to resume the human shape. The new discovered Americans about Nootka-Sound, at this time, disguise themselves in dresses made of the skins of wolves, and other wild beasts, and wear even the heads fitted to their own. These habits they use in the chace, to circumvent the animals of the field. But would not ignorance or superstition ascribe to a supernatural metamorphosis these temporary expedients to deceive the brute creation?

106 Customs and dresses common to the eastern Asiatics & the Americans.

"In their marches, the Kamtschatkans never went abreast, but followed one another in the same track. The same custom is exactly observed by the Americans.

"The Tungusi, the most numerous nation resident in Siberia, prick their faces with small punctures, with a needle, in various shapes; then rub into them charcoal, so that the marks become indelible. This custom is still observed in several parts of America. The Indians on the back of Hudson's Bay, to this day, perform the operation exactly in the same manner, and puncture the skin into various figures; as the natives of New-Zealand do at present, and as the ancient Britons did with the herb glastum, or woad; and the Virginians, on the first discovery of that country by the English.

"The Tungusi use canoes made of birch-bark, distended over ribs of wood, and nicely sowed together. The Canadian, and many other American nations, use no other sort of boats. The paddles of the Tungusi, are broad at each end; those of the people near Cook's river, and of Oonalascha, are of the same form.

"In burying of the dead, many of the American nations place the corpse at full length, after preparing it according to their customs; others place it in a sitting posture, and lay by it the most valuable cloathing, wampum, and other matters. The Tartars did the same: and both people agree in covering the whole with earth, so as to form a tumulus, barrow, or carnedd.

"Some of the American nations hang their dead in trees. Certain of the Tungusi observe a similar custom.

"We can draw some analogy from dress; conveniency in that article must have been consulted on both continents, and originally the materials must have been the same, the skins of birds and beasts. It is singular, that the conic bonnet of the Chinese should be found among the people of Nootka. I cannot give into the notion, America. notion, that the Chinese contributed to the population of the New-World; but we can readily admit, that a shipwreck might furnish those Americans with a pattern for that part of the dress.

107 Other resemblances.

"In respect to the features and form of the human body, almost every tribe found along the western coast has some similitude to the Tartar nations, and, still, retain the little eyes, small noses, high cheeks, and broad faces. They vary in size, from the lusty Calmucs to the little Nogaians. The internal Americans, such as the Five-Indian nations, who are tall of body, robust in make, and of oblong faces, are derived from a variety among the Tartars themselves. The fine race of Tschutski seems to be the stock from which those Americans are derived. The Tschutski, again, from that fine race of Tartars the Kabardinski, or inhabitants of Kabarda.

"But, about Prince William's-Sound begins a race chiefly distinguished by their dress, their canoes, and their instruments of the chace, from the tribes to the south of them. Here commences the Esquimaux people, or the race known by that name in the high latitudes of the eastern side of the continent. They may be divided into two varieties. At this place, they are of the largest size. As they advance northward, they decrease in height, till they dwindle into the dwarfish tribes which occupy some of the coasts of the Icy-Sea, and the maritime parts of Hudson's-Bay, of Greenland, and Terra de-Labrador. The famous Japanese map places some islands seemingly within the straits of Behring, on which is bestowed the title of *Ya-Zue*, or the Kingdom of the Dwarfs. Does not this in some manner authenticate the chart, and give us reason to suppose that America was not unknown to the Japanese; and that they had (as is mentioned by Kæmpfer and Charlevoix) made voyages of discovery, and, according to the last, actually wintered on the continent? That they might have met with the Esquimaux is very probable; whom, in comparison of themselves, they might justly distinguish by the name of *dwarfs*. The reason of their low stature is very obvious: these dwell in a most severe climate, amidst penury of food; the former in one much more favourable, abundant in provisions; circumstances that tend to prevent the degeneracy of the human frame. At the island of Oonalascha, a dialect of the Esquimaux is in use, which was continued along the whole coast from thence northward."

108 The brute creation migrated by the same route.

The continent which stocked America with the human race, is supposed, by Mr Pennant, to have poured in the brute creation, through the same passage. Very few quadrupeds continued in the peninsula of Kamtschatka; Mr Pennant enumerates only 25 which are inhabitants of land: all the rest persisted in their migration, and fixed their residence in the New-World. Seventeen of the Kamtschatkan quadrupeds are found in America: others are common only to Siberia, or Tartary, having, for unknown causes, entirely evacuted Kamtschatka, and divided themselves between America and the parts of Asia above cited. Multitudes, again, have deserted the Old-World, even to an individual, and fixed their seats at distances most remote from the spot from which they took their departure; from mount Ararat, the resting-place of the ark, in a central part of the Old-World, and excellently adapted for the dispersion of the animal creation, to all its parts. "We need not be startled (says Mr Pennant) at the vast journeys many of the quadrupeds took to arrive at their presents seats. Might not numbers of species have found a convenient abode in the vast alps of Asia, instead of wandering to the Cordilleras of Chili? or might not others have been contented with the boundless plains of Tartary, instead of travelling thousands of miles to the extensive flats of Pampas?—To endeavour to elucidate common difficulties is certainly a trouble worthy of the philosopher, and of the divine; not to attempt it would be a criminal indolence, a neglect to

Vindicate the ways of God to man.

But there are multitudes of points beyond the human ability to explain, and yet are truths undeniable: the facts are indisputable, notwithstanding the causes are concealed. In such cases, faith must be called in to our relief. It would, certainly, be the height of folly to deny to that Being who broke open the great fountains of the deep to effect the deluge—and afterwards, to compel the dispersion of mankind to people the globe, directed the confusion of languages—powers inferior in their nature to these. After these wondrous proofs of omnipotency, it will be absurd to deny the possibility of infusing instinct into the brute creation. *Deus est anima brutorum;* "God himself is the soul of brutes:" his pleasure must have determined their will, and directed several species, and even whole genera, by impulse irresistible, to move by slow progression to their destined regions. But for that, the llama and the pacos might still have inhabited the heights of Armenia, and some more neighbouring Alps, instead of labouring to gain the distant Peruvian-Andes; the whole genus of armadillos, slow of foot, would never have quitted the torrid-zone of the Old-World for that of the New; and the whole tribe of monkeys would have gamboled together in the forests of Indie, instead of dividing their residence between the shades of Indostan, and the deep forests of the Brasils. Lions and tigers might have infested the hot parts of the New-World, as the first do the desarts of Africa, and the last the provinces of Asia; or the pantherine animals of South-America might have remained additional scourges with the savage beasts of those ancient continents. The Old-World would have been overstocked with animals; the New remained an unanimated waste! or both have contained an equal portion of every beast of the earth. Let it not be objected, that animals bred in a southern climate, after the descent of their parents from the ark, would be unable to bear the frost and snow of the rigorous north, before they reached South-America, the place of their final destination. It must be considered, that the migration must have been the work of ages; that in the course of their progress each generation grew hardened to the climate it had reached; and that, after their arrival in America, they would again be gradually accustomed to warmer and warmer climates, in their removal from north to south, as they had in the reverse, or from south to north. Part of the tigers still inhabit the eternal snows of Ararat, and multitudes of the very same species live, but with exalted rage, beneath the line, in the burning soil of Borneo, or Sumatra; but neither lions or tigers

America. tigers ever migrated into the New-World. A few of the first are found in India and Persia, but they are found in numbers only in Africa. The tiger extends as far north as western Tartary, in lat. 40. 50. but never has reached America."

In fine, the conjectures of the learned respecting the vicinity of the Old and New-World are now, by the discoveries of late great navigators, lost in conviction; and, in the place of imaginary hypotheses, the real place of migration is almost incontrovertibly pointed out. Some (from a passage in Plato) have extended over the Atlantic, from the straits of Gibralter to the coast of North and South-America, an island equal in size to the continents of Asia and Africa; over which had passed, as over a bridge, from the latter, men and animals; wool-headed negroes, and lions and tigers, none of which ever existed in the New-World. A mighty sea arose, and, in one day and night, engulphed this stupendous tract, and with it every being which had not completed its migration into America. The whole negro race, and almost every quadruped, now inhabitants of Africa, perished in this critical day. Five only are to be found, at present, in America; and of these only one, the bear, in South-America: Not a single custom, common to the natives of Africa and America, to evince a common origin. Of the quadrupeds, the bear, stag, wolf, fox, and weesel, are the only animals which we can pronounce, with certainty, to be found on each continent. The stag, the fox, and the weesel, have made, also, no farther progress in Africa than the north; but on the same continent the wolf is spread over every part, yet is unknown in South-America, as are the fox and weesel. In Africa and in South-America the bear is very local, being met with only in the north of the first, and on the Andes in the last. Some cause unknown arrested its progress in Africa, and impelled the migration of a few into the Chilian-Alps, and induced them to leave unoccupied the vast tract from North-America to the lofty Cordilleras.

109 Remains of antiquity in America.

Allusions have often been made by travellers and others, to some remains in America which appeared to owe their original to a people more intimately acquainted with the arts of life than the *savage* tribes which inhabited this continent on its first discovery by the Europeans, or than those which are, at present, scattered through various parts of its extent. In a small work, published in London, in 1787, entitled *Observations on some parts of natural history: to which is prefixed, an account of several remarkable vestiges of an ancient date, which have been discovered in different parts of America.* Part I. the author has collected the scattered hints of Kalm, of Carver, of Filson, and some other travellers, and writers; and has added a plan and description of a regular work, which he supposes to have been a *fortification*, that has been discovered near the confluence of the rivers Ohio and Muskingum. The remains described, or alluded to, in this publication, are characters, or singular marks, which were supposed by some Jesuits, who examined them, to be *Tartarian*; furrows, as if the land had been ploughed; a stone wall; mounds of earth, of different forms and sizes; earthen walls, and ditches, &c.

The mounds of earth are supposed, by the author, to have been designed for different purposes: the *smaller* ones are, evidently, tumuli, or repositories of the dead; and, he thinks, the larger ones, as that at Grave-Creek (a branch of the Ohio); many which are to be seen in Mexico, and in other parts of America, were intended to serve as the bases of temples.

The most curious part of this little work is the description, together with the plan, of the supposed fortification, above alluded to. It is situated on the east side of the river Muskingum, about half a mile above its junction with the river Ohio, nearly in the latitude of 39. 21. and about 170 miles below Fort-Pitt, at the confluence of the rivers Alleghany and Monangahela. The town, as it has been sometimes called, is a large level, encompassed by walls of a tetragon form; occupying a piece of ground about one quarter of a mile square. These walls are from six to ten feet in height, and from twenty to forty feet in thickness. They are, at present, overgrown with vegetables, of different kinds, and, among others, with trees, some of which are of a very considerable diameter. Each side of the walls is divided, by three chasms, or openings, into four, nearly equal, parts: these chasms are directly opposite to each other. Within the walls there are three elevations; the largest of these is of an oblong form, 74 yards long, 44 yards broad, and 6 feet in height: the second is nearly of a similar form, 50 yards long, and 40 broad: the third is, also, an oblong mount, but much smaller. Besides these three elevations, there is a small circular mount, placed nearly in the centre of four small caves; and a "semi-circular parapet," which, it is not improbable, may have been designed to guard one of the chasms, or openings: this parapet has a small mount. The author observes, that the three elevations "considerably resemble some of "the eminences which have been discovered near the "river Mississippi," of which he has given an account in his publication.

The fortifications (for a distinction has been made between them and the town, but we cannot see with what great propriety) are nearly of the same form as the town. The walls have here, also, openings: and at each of these openings there is one, or more of the small circular mounts.

The pyramid is one of the most conspicuous parts of these singular remains. It is of a circular form; 50 feet in height; 390 feet in circumference; and is surrounded with a ditch, 5 feet deep, and 15 feet wide: externally to the ditch there is a parapet, which is 759 feet in circumference. "The pyramid, as well as "the eminences and walls, is now covered with grasses, "and other kinds of vegetables." Besides these, there are several other eminences, of which we do not think it necessary to take any notice, in this place.

The author's opinion concerning these remains is this; that they owe their original to "the Toltecas, or some other Mexican nation," and that these people were, probably, the descendants of the Danes. The first member of this *conjecture* appears not improbable, if we consider the similarity of the Mexican mounts and fortifications, described by Torquemada, by the Abbé Clavigero, and by other authors, to those of which our author has published an account; and, also, if we consider the tradition of the Mexicans, that they came from the north-west, in which tract great numbers of these remains have been discovered. As to the second member of this conjecture, we think it but feebly supported; although

although we are not ignorant that Grotius and other writers have endeavoured to prove, that the northern nations of Europe had, actually, ſome intercourſe with America, long before the time of Columbus. See n° 112. *infra.*

110 **The ancients ſuppoſed to have had ſome imperfect notion of a new world.**

It is believed, by many, that the ancients had ſome imperfect notion of the New-World; and ſeveral ancient authors are quoted in confirmation of this opinion. In a book, aſcribed to the philoſopher Ariſtotle, we are told that the Carthaginians diſcovered an iſland, far beyond the pillars of Hercules, large, fertile, and finely watered, with navigable rivers, but uninhabited. This iſland was diſtant a few days ſailing from the continent: its beauty induced the diſcoverers to ſettle there; but the policy of Carthage diſlodged the colony, and laid ſtrict prohibition on all the ſubjects of the ſtate not to attempt any future eſtabliſhment. This account is alſo confirmed by an hiſtorian of no mean credit, who relates, that the Tyrians would have ſettled a colony on the newly-diſcovered iſland, but were oppoſed by the Carthaginians, for ſtate reaſons. The following paſſage has been quoted, likewiſe, from Seneca's *Medea*, in confirmation of this notion.

> ——*Venient annis*
> *Sæcula ſeris, quibus oceanus*
> *Vincula rerum laxet, & ingens*
> *Pateat tellus, Typhiſque novos*
> *Delegat orbes: nec ſit terris*
> *Ultima Thule.*——
>
> Act. iii. ver. 375.

111 **Pretenſions of the Welſh to the diſcovery of America, in the 12th century.**

The Welſh, fondly, imagine that their country contributed, in 1170, to people the New-World, by the adventure of Madoc, ſon of Owen Gwynedd, who, on the death of his father, ſailed there, and colonized part of the country. It is pretended that Madoc made two voyages: that ſailing weſt, he left Ireland ſo far to the north, that he came to a land unknown, where he ſaw many ſtrange things; that he returned home, and, making a report of the fertility of the newly-diſcovered country, prevailed on numbers of the Welſh, of each ſex, to accompany him, on a ſecond voyage, from which he never returned. The favourers of this opinion aſſert, that ſeveral Welſh words, ſuch as *gwrando*, "to hearken, or liſten;" the iſle of *Croeſo*, or "welcome;" *Cape-Breton*, from the name of the Britiſh-iſland; *gwynndwr*, or "the white water;" and *pingwin*, or "the bird with a white head;" are to be found in the American language. But likeneſs of ſound, in a few words, will not be deemed ſufficient to eſtabliſh the fact; eſpecially if the meaning has been evidently perverted: for example, the whole pinguin tribe have, unfortunately, not only black heads, but are not inhabitants of the northern hemiſphere; the name was alſo beſtowed on them by the Dutch, *a pinguedine*, from their exceſſive fatneſs. It may be added, that the Welſh were never a naval people; that the age in which Madoc lived was peculiarly ignorant in navigation; and the moſt which they could have attempted muſt have been a mere coaſting voyage.

112 **Thoſe of the Norwegians better founded.**

The Norwegians put in for a ſhare of the glory, on grounds rather better than the Welſh. By their ſettlements in Iceland, and in Greenland, they had arrived within ſo ſmall a diſtance of the New-World, that there is a probability of its having been touched at by a people ſo verſed in maritime affairs, and ſo adventurous, as the ancient Nortmans were. The proofs are much more numerous than thoſe produced by the Britiſh hiſtorians; for the diſcovery is mentioned in ſeveral of the Icelandic manuſcripts. The period was about the year 1002, when it was viſited by one Biorn; and the diſcovery purſued to greater effect by Leif, the ſon of Eric, the diſcoverer of Greenland. It does not appear that they reached farther than Labrador; on which coaſt they met with Eſquimaux, on whom they beſtowed the name of *Skrælingues*, or dwarfiſh people, from their ſmall ſtature. They were armed with bows and arrows, and had leathern canoes, ſuch as they have at preſent. All this is probable; nor ſhould the tale of the German, called *Turkil*, one of the crew, invalidate the account. He was, one day, miſſing; but ſoon returned, leaping and ſinging, with all the extravagant marks of joy a *bon vivant* could ſhow, on diſcovering the inebriating fruit of his country, the grape: Torfæus even ſays, that he returned in a ſtate of intoxication. To convince his commander, he brought ſeveral bunches: and the country, from that circumſtance, was named *Vinland*. There appears no reaſon to doubt of the diſcovery; it is thought probable, however, that theſe people reached no farther than the barren country of Labrador. In ſhort, it is from a much later period that we muſt date the *unequivocal* diſcovery of America.

113 **The projects of Chriſtopher Columbus.**

Towards the cloſe of the 15th century, Venice and Genoa being rivals in commerce, in which the former had greatly the ſuperiority, Chriſtopher Colon, or Columbus, a native of Genoa, conceived a project of ſailing to the Eaſt-Indies by directing his courſe weſtward. This deſign was founded upon a miſtake of the geographers, of thoſe days, who placed the eaſtern parts of Aſia immenſely too far to the eaſtward; ſo that had they been in the right, the ſhorteſt way would have been to ſail directly weſtward. Columbus applied, firſt, to his own countrymen; but being rejected by them, he applied to Portugal, where he met with no better ſucceſs. Spain was his next reſource: here, after eight years attendance, he obtained, in 1492, a fleet of three ſhips. The largeſt, a ſhip of no conſiderable burthen, was commanded by Columbus, as admiral, who gave it the name of *Santa Maria*, out of reſpect for the bleſſed Virgin, whom he honoured with ſingular devotion. Of the ſecond, called the *Pinta*, Martin Pinzon was captain, and his brother Francis pilot. The third, named the *Nigna*, was under the command of Vincent Yanez Pinzon. Theſe two were light veſſels, hardly ſuperior in burden, or force, to large boats. This ſquadron, if it merits that name, was victualled for 12 months, and had on board 90 men, moſtly ſailors, together with a few adventurers, who followed the fortune of Columbus, and ſome gentleman of Iſabella's court, whom ſhe appointed to accompany him. Though the expence of the undertaking was one of the circumſtances which chiefly alarmed the court of Spain, and retarded, ſo long, the negociation with Columbus, the ſum employed in fitting out this ſquadron did not exceed 4000l. As Columbus was deeply impreſſed with ſentiments of religion, he would not ſet out upon an expedition ſo arduous, and of which one great object was to extend the knowledge of the Chriſtian faith, without imploring, publicly, the guidance

America. dance and protection of Heaven. With this view, he, together with all the persons under his command, marched, in solemn procession, to the monastery of Rabida. After confessing their sins, and obtaining absolution, they received the holy sacrament from the hands of the guardian, who joined his prayers to theirs for the success of an enterprise which he had so zealously patronized.

Next morning, being Friday, the third day of August, in the year 1492, Columbus set sail, a little before sun-rise, in presence of a vast crowd of spectators,
114 His voyage
who sent up their supplications to Heaven for the prosperous issue of the voyage, which they wished, rather than expected. Columbus steered, directly, for the Canary-Islands, and arrived there without any occurrence that would have deserved notice on any other occasion: but, in a voyage of such expectation and importance, every circumstance was the object of attention. The rudder of the Pinta broke loose, the day after she left the harbour, and that accident alarmed the crew, no less superstitious than unskilful, as a certain omen of the unfortunate destiny of the expedition. Even in the short run to the Canaries, the ships were found to be so crazy, and ill appointed, as to be very improper for a navigation which was expected to be both long and dangerous. Columbus refitted them, however, to the best of his power; and having supplied himself with fresh provisions, he took his departure from Gomera, one of the most westerly of the Canary-Islands, on the sixth day of September.

Here the voyage of discovery may properly be said to begin; for Columbus, holding his course due west, left, immediately, the usual track of navigation, and stretched into unfrequented and unknown seas. The first day, as it was very calm, he made but little way; but on the second he lost sight of the Canaries; and many of the sailors, already dejected and dismayed, when they contemplated the boldness of the undertaking, began to beat their breasts, and to shed tears, as if they were never more to behold land. Columbus comforted them with assurances of success, and the prospect of vast wealth, in those opulent regions whither he was conducting them. He regulated every thing by his sole authority; he superintended the execution of every order; and, allowing himself only a few hours for sleep, he was at all other times upon deck. As his course lay through seas which had not, formerly, been visited, the sounding-line, or instruments for observation were continually in his hands. After the example of the Portuguese discoverers, he attended to the motion of tides and currents, watched the flight of birds, the appearance of fishes, of sea-weeds, and of every thing that floated on the waves, and entered every occurence, with a minute exactness, in the journal which he kept. As the length of the voyage could not fail of alarming sailors habituated only to short excursions, Columbus endeavoured to conceal from them the real progress which they made. With this view, though they ran 18 leagues the second day, after they left Gomera, he gave out that they had advanced only 15, and he, uniformly, employed the same artifice of reckoning short, during the whole voyage. By the 14th of September, the fleet was above 200 leagues to the west of the Canary-Isles. There they were struck with an appearance, no less astonishing than new. They observed that the magnetic needle, in their compasses, did not point exactly to the polar star, but varied towards the west; and, as they proceeded, this variation increased. This appearance, which is now familiar, though it still remains one of the mysteries of nature, into the cause of which the sagacity of man hath not been able to penetrate, filled the companions of Columbus with terror. They were now in a boundless, unknown, ocean, far from the usual course of navigation; nature itself seemed to be altered, and the only guide which they had left was about to fail them. Columbus, with no less quickness than ingenuity, invented a reason for this appearance, which, though it did not satisfy himself, seemed so plausible to them, that it dispelled their fears, or silenced their murmurs.

America. 115 Astonishment occasioned by observing the variation of the compass.

He still continued to steer due west, nearly in the same latitude with the Canary-Islands. In this course, he came within the sphere of the trade-wind, which blows, invariably, from east to west, between the tropics, and a few degrees beyond them. He advanced before this steady gale with such uniform rapidity, that it was seldom necessary to shift a sail. When about 400 leagues to the west of the Canaries, he found the sea so covered with weeds, that it resembled a meadow of vast extent; and in some places they were so thick, as to retard the motion of the vessels. This strange appearance occasioned new alarm and disquiet. The sailors imagined that they were now arrived at the utmost boundary of the navigable ocean; that these floating weeds would obstruct their farther progress, and concealed dangerous rocks, or some large tract of land, which had sunk, they knew not how, in that place. Columbus endeavoured to persuade them, that what had alarmed, ought rather to have encouraged them, and was to be considered as a sign of approaching land. At the same time, a brisk gale arose, and carried them forward. Several birds were seen hovering about the ship, and directed their flight towards the west. The desponding crew resumed some degree of spirit, and began to entertain fresh hopes.

Upon the first of October they were, according to the admiral's reckoning, 770 leagues to the west of the Canaries: but, lest his men should be intimidated by the prodigious length of the navigation, he gave out that they had proceeded only 584 leagues; and, fortunately for Columbus, neither his own pilot, nor those of the other ships, had skill sufficient to correct this error, and to discover the deceit. They had, now, been above three weeks at sea: they had proceeded far beyond what former navigators had attempted, or deemed possible: all their prognostics of discovery, drawn from the flight of birds, and other circumstances, had proved fallacious: the appearances of land, with which their own credulity, or the artifice of their commander, had, from time to time, flattered and amused them, had been altogether illusive, and their prospect of success seemed now to be as distant as ever. These reflections occurred often to men, who had no other object, or occupation, than to reason and to discourse concerning the intention and circumstances of their expedition. They made impression, at first, upon the ignorant and timid, and extending, by degrees, to such as were better informed, or more resolute, the contagion spread, at length, from ship to ship. From secret whispers and murmurings, they proceeded to open cabals and public complaints.

plaints. They taxed their ſovereign with inconſiderate credulity, in paying ſuch regard to the vain promiſes and raſh conjectures of an indigent foreigner, as to hazard the lives of ſo many of her own ſubjects, in proſecuting a chimerical ſcheme. They affirmed that they had fully performed their duty, by venturing ſo far in an unknown and hopeleſs courſe, and could incur no blame, for refuſing to follow, any longer, a deſperate adventurer to certain deſtruction. They contended, that it was neceſſary to think of returning to Spain, while their crazy veſſels were ſtill in a condition to keep the ſea, but expreſſed their fears that the attempt would prove vain, as the wind, which had hitherto been ſo favourable to their courſe, muſt render it impoſſible to ſail in the oppoſite direction. All agreed that Columbus ſhould be compelled by force to adopt a meaſure on which their common ſafety depended. Some of the more audacious propoſed, as the moſt expeditious and certain method for getting rid, at once, of his remonſtrances, to throw him into the ſea; being perſuaded that, upon their return to Spain, the death of an unſucceſsful projector would excite little concern, and be inquired into with no curioſity.

Columbus was fully ſenſible of his perilous ſituation. He had obſerved, with great uneaſineſs, the fatal opera-
116 Perilous ſituation of Columbus. tion of ignorance, and of fear, in producing diſaffection, among his crew; and ſaw that it was now ready to burſt out into open mutiny. He retained, however, perfect preſence of mind. He affected to ſeem ignorant of their machinations. Notwithſtanding the agitation and ſolicitude of his own mind, he appeared with a chearful countenance; like a man ſatisfied with the progreſs which he had made, and confident of ſucceſs. Sometimes he employed all the arts of inſinuation to ſoothe his men. Sometimes he endeavoured to work upon their ambition, or avarice, by magnificent deſcriptions of the fame and wealth which they were about to acquire. On other occaſions, he aſſumed a tone of authority, and threatened them with vengeance from their ſovereign, if, by their daſtardly behaviour, they ſhould defeat this noble effort to promote the glory of God, and to exalt the Spaniſh name, above that of every other nation. Even with ſeditious ſailors, the words of a man, whom they had been accuſtomed to reverence, were weighty and perſuaſive; and not only reſtrained them from thoſe violent exceſſes which they meditated, but prevailed with them to accompany their admiral for ſome time longer.

As they proceeded, the indications of approaching land ſeemed to be more certain, and excited hope in proportion. The birds began to appear in flocks making towards the ſouth-weſt. Columbus, in imitation of the Portugueſe navigators, who had been guided in ſeveral of their diſcoveries by the motion of birds, altered his courſe from due weſt towards that quarter whither they pointed their flight. But after holding on for ſeveral days in this new direction without any
117 His crew ready to mutiny, better ſucceſs than formerly, having ſeen no object during 30 days but the ſea and the ſky, the hopes of his companions ſubſided faſter than they had riſen; their fears revived with additional force; impatience, rage, and deſpair, appeared in every countenance. All ſenſe of ſubordination was loſt. The officers, who had hitherto concurred with Columbus in opinion, and ſupported his authority, now took part with the private men: they aſſembled, tumultuouſly, on the deck, expoſtulated with their commander, mingled threats with their expoſtulations, and required him inſtantly to tack about, and to return to Europe. Columbus perceived that it would be of no avail to have recourſe to any of his former arts, which having been tried ſo often had loſt their effect; and that it was impoſſible to re-kindle any zeal for the ſucceſs of the expedition among men in whoſe breaſts fear had extinguiſhed every generous ſentiment. He ſaw that it was no leſs vain to think of employing either gentle or ſevere meaſures, to quell a mutiny ſo general and ſo violent. It was neceſſary, on all theſe accounts, to ſoothe paſſions which he could no longer command, and to give way to a torrent too impetuous to be checked. He promiſed, ſolemnly, to his men, that he would comply with their requeſt, provided they would accompany him, and obey his commands for three days longer, and if, during that time, land were not diſcovered, he would then abandon the enterpriſe and direct his courſe towards Spain.

Enraged as the ſailors were, and impatient to turn their faces again towards their native country, this propoſition did not appear to them unreaſonable. Nor did Columbus hazard much in confining himſelf to a term ſo ſhort. The preſages of diſcovering land were now ſo numerous and promiſing, that he deemed them infallible. For ſome days the ſounding line had reached the bottom, and the ſoil which it brought up indicated land to be at no great diſtance. The flocks of birds increaſed; and were compoſed not only of ſea fowl, but of ſuch land-birds as could not be ſuppoſed to fly far from the ſhore. The crew of the Pinta obſerved a cane floating which ſeemed to be newly cut, and likewiſe a piece of timber artificially carved. The ſailors aboard the Nigna took up the branch of a tree, with red berries, perfectly freſh. The clouds around the ſetting ſun aſſumed a new appearance; the air was more mild and warm; and, during night, the wind became unequal and variable. From all theſe ſymptoms, Columbus was ſo confident of being near land, that, on the evening of the 11th of October, after public prayers for ſucceſs, he ordered the ſails to be furled and the ſhips to lie by, keeping ſtrict watch, leſt they ſhould be driven aſhore in the night. During this interval of ſuſpence and expectation, no man ſhut his eyes, all kept upon deck, gazing intently towards that quarter where they expected to diſcover the land, which had been ſo long the object of their wiſhes.

About two hours before midnight, Columbus ſtanding on the forecaſtle, obſerved a light at a diſtance, 118 Their joy
and privately pointed it out to Pedro Guttierez, a on deſcrying
page of the queen's wardrobe. Guitterez perceived it; ing land.
and calling to Salcedo, comptroller of the fleet, all three ſaw it in motion, as if it were carried from place to place. A little after midnight, the joyful ſound of *Land! land!* was heard from the Pinta, which kept always a-head of the other ſhips. But having been ſo often deceived by fallacious appearances, every man was now become ſlow of belief; and waited, in all the anguiſh of uncertainty and impatience, for the return of day. As ſoon as morning dawned, all doubts and fears were diſpelled. From each ſhip, an iſland was ſeen about two leagues to the north, whoſe flat and verdant fields, well ſtored with wood, and watered with many rivulets, preſented the aſpect of a delightful country,

country. The crew of the Pinta instantly began the *Te Deum*, as a hymn of thanksgiving to God; and were joined by those of the other ships, with tears of joy and transports of congratulation. This office of gratitude to Heaven was followed by an act of justice to their commander. They threw themselves at the feet of Columbus, with feelings of self-condemnation mingled with reverence. They implored him to pardon their ignorance, incredulity, and insolence, which had created him so much unnecessary disquiet, and had so often obstructed the prosecution of his well-concerted plan; and passing, in the warmth of their admiration, from one extreme to another, they now pronounced the man whom they had so lately reviled, and threatened, to be a person inspired by Heaven, with sagacity and fortitude more than human, in order to accomplish a design so far beyond the ideas and conception of all former ages.

As soon as the sun arose, all their boats were manned and armed. They rowed towards the island with their colours displayed, with warlike music, and other martial pomp. As they approached the coast, they saw it covered with a multitude of people, whom the

119 They land in one of the islands of the New-World.

novelty of the spectacle had drawn together, whose attitudes and gestures expressed wonder and astonishment, at the strange objects which presented themselves to their view. Columbus was the first European who set foot in the New-World, which he had discovered. He landed in a rich dress, and with a naked sword in his hand. His men followed; and, kneeling down, they all kissed the ground which they had so long desired to see. They, next, erected a crucifix; and, prostrating themselves before it, returned thanks to God for conducting their voyage to such an happy issue.

The above was one of the Bahama-Islands; to which he gave the name of *San Salvador*, and took possession of it, in the name of their Catholic majesties. In this first voyage he discovered several other of the Lucayo, or Bahama-Islands, with those of Cuba and Hispaniola. The natives considered the Spaniards as divinities, and the discharge of the artillery their thunder: they fell prostrate at the sound. The women, however, offered their favours, and courted the embraces of their new guests as men. Their husbands were not jealous of them; and in the arms of those wantons the companions of Columbus are said, by some authors, to have caught that malady which directs its poison to the springs of life. In a second voyage, many new islands were discovered. In a third, he attained the great object of his ambition,

120 The continent afterwards discovered.

by discovering the continent of America, near the mouth of the river Oronooko, on the first day of August 1498. His success produced a crowd of adventurers, from all nations; but the year before this, the northern continent had been discovered by Sebastian Cabot, in the service of Henry VII. of England.

Notwithstanding the many settlements of the Europeans in this continent, great part of America remains still unknown. The northern continent contains the

121 Division of America.

British colonies of Hudson's-Bay, Canada, and Nova-Scotia; the New-England states, New-York, New-Jersey, Pennsylvania, Maryland, Virginia, North and South, Carolina, and Georgia. It contains, also, the Spanish territories of East, and West, Florida, Louisiana, New-Mexico, California, and Mexico. Besides these, there are immense regions to the west, and north, the boundaries of which have never yet been discovered. In such as are in any degree known, dwell the Esquimaux, the Algonquins, the Hurons, the Iroquois, the Cheerake, the Chickasaws, and many other tribes of Indians. In the southern continent lie the Spanish provinces of Tierra-Firme, Guiana, Peru, Paraguay, and Chili; together with that of Brasil, belonging to the Portuguese; and the country of Surinam, belonging to the Dutch. Vast tracts, however, in the inland parts, are unknown, being comprehended under the general name of *Amazonia*. A large district, also, said to be the residence of a gigantic race of men, lies on the east side of the continent, between the straits of Magellan and the province of Paraguay. See the article PATAGONIA.

122 Its productions.

This vast country produces many of the metals, minerals, plants, fruits, trees, and wood, to be met with in the other parts of the world, and many of them in greater quantities, and in high perfection. The gold and silver of America have supplied Europe with such immense quantities of those valuable metals, that they are become vastly more common; so that the gold and silver of Europe now bear little proportion to the high price set upon them before the discovery of America.

It also produces diamonds, pearls, emeralds, amethysts, and other valuable stones, which, by being brought into Europe, have contributed, likewise, to lower their value. To these, which are chiefly the productions of Spanish-America, may be added a great number of other commodities, which, though of less price, are of much greater use. Of these are the plentiful supplies of cochineal, indigo, anatto, logwood, brazil, fustic, pimento, lignum vitæ, rice, ginger, cocoa, or the chocolate-nut, sugar, cotton, tobacco, banillas, red-wood, the balsams of Tolu, Peru, and Chili, that valuable article, in medicine, the Jesuit's bark, mechoacan, sassafras, sarsaparilla, cassia, tamarinds, hides, furs, ambergrise, and a great variety of woods, roots, and plants; to which, before the discovery of America, the Europeans were either entire strangers, or which they were forced to buy at an extravagant rate from Asia and Africa, through the hands of the Venetians and Genoese, who then engrossed the trade of the Eastern-World.

On this continent there grows also a variety of excellent native fruits; as pine-apples, citrons, lemons, oranges, malicatons, figs, grapes, great numbers of culinary, medicinal, and other herbs, roots, and plants, with many exotic productions, which are nourished in as great perfection as in their native soil.

123 The different possessors of America.

Although the Indians still live in the quiet possession of many large tracts, America, so far as known, is chiefly claimed, and divided into colonies, by three European nations, the Spaniards, English, and Portuguese. The Spaniards, as they first discovered it, have the largest and richest portion, extending from New-Mexico and Louisiana, in North-America, to the straits of Magellan, in the South-Sea, excepting the large province of Brasil, which belongs to Portugal; for though the French and Dutch have some forts upon Surinam and Guiana, they scarcely deserve to be considered as proprietors of any part of the southern continent.

Next to Spain, the most considerable proprietor of America was Great Britain, who derived her claim to North-America from the first discovery of that continent by Sebastian Cabot, in the name of Henry VII.

anno

America. *anno* 1497, about six years after the the discovery of South-America by Columbus, in the name of the king of Spain. This country was in general called *Newfoundland;* a name which is now appropriated solely to an island upon its coast. It was a long time before the English made any attempt to settle in this country. Sir Walter Raleigh, an uncommon genius and a brave commander, first showed the way, by planting a colony in the southern part, which he called *Virginia*, in honour of his virgin mistress Queen Elizabeth.

The French indeed, from this period until the conclusion of the war before last, laid a claim to, and actually possessed, Canada and Louisiana; comprehending all that extensive inland country reaching from Hudson's-Bay, on the north, to Mexico and the gulph of the same name, on the south. But, in that war, they were not only driven from Canada and its dependencies, but obliged to relinquish all that part of Louisiana lying on the east side of the Mississippi, as related under the *History of Britain*. And thus the British colonies were preserved, secured, and extended so far, as to render it difficult to ascertain the precise bounds of empire in North America. To the northward they might have extended their claims quite to the pole itself, nor did any nation seem inclined to dispute the property of this nothernmost country with them. From that extremity they had a territory extending, southward, to Cape Florida in the Gulph of Mexico, N. Lat. 25°, and consequently near 4000 miles long in a direct line. And to the westward, their boundaries reached to nations unknown even to the Indians of Canada.

124 Vast extent of the British possessions before the late revolution.

Of the revolution that has since taken place, by which a great part of those territories has been torn from the British empire, the history follows in the next article.

125 Rise of the American republic.

America, (United States of). Of the rise and establishment of this republic, which has given a new face to the western world, a succinct and impartial narrative shall in this article be attempted; in which, however, we cannot hope entirely to avoid errors, as they are perhaps unavoidable. The accounts from which the historian must derive his information are not yet cleared from the mistakes of prejudice and the fabrications of party; when they differ, their comparative authenticity is with difficulty ascertained; and they want, above all, that softening which they can receive from time alone.

The beginnings, even of the most celebrated political institutions of the old world, are generally involved in fable and obscurity: The barbarous manners of savage tribes in the early and uncultivated state of society, renders the researches of the historian painful and unsatisfactory. Very different were the circumstances which gave birth to this new republic, which at a future period, bids fair to surpass even the splendor of Rome.

126 State and character of the British colonies at the end of the war 1763.

The state of the British colonies at the conclusion of the war in 1763, was such as attracted the attention of all the politicians in Europe. Their flourishing condition at that period was remarkable and striking; their trade had prospered in the midst of all the difficulties and distresses of a war in which they were so nearly and so immediately concerned. Their population continued on the increase, notwithstanding the ravages and depredations that had been so fiercely carried on by the French, and the native Indians in their alliance. They abounded with spirited and active individuals of all denominations. They were flushed with the uncommon prosperity that had attended them in their commercial affairs and military transactions. Hence they were ready for all kind of undertakings, and saw no limits to their hopes and expectations.

As they entertained the highest opinion of their value and importance, and of the immense benefit that Britain derived from its connection with them, their notions were adequately high in their own favour. They deemed themselves, not without reason, entitled to every kindness and indulgence which the mother-country could bestow.

Although their pretensions did not amount to a perfect equality of advantages and privileges in matters of commerce, yet in those of government they thought themselves fully competent to the task of conducting their domestic concerns, with little or no interference from abroad. Though willing to admit the supremacy of Great Britain, they viewed it with a suspicious eye, and with a marked desire to restrain it within its strict constitutional boundaries.

Their improvements in all the necessary and useful arts did honor to their industry and ingenuity. Though they did not live in the luxury of Europe, they had all the solid and substantial enjoyments of life, and were not unacquainted with many of its elegancies and refinements.

A circumstance much to their praise is, that notwithstanding their peculiar addiction to those occupations of which lucre is the sole object, they were duly attentive to cultivate the field of learning; and they have, ever since their first foundation, been particularly careful to provide for the education of the rising progeny.

Their vast augmentation of internal trade and external commerce, was not merely owing to their position and facility of communication with other parts; it arose also from their natural turn and temper, full of schemes and projects; ever aiming at new discoveries, and continually employed in the search of the means of improving their condition.

Their condition carried them into every quarter from whence profit could be derived. There was scarcely any port of the American hemisphere to which they had not extended their navigation. They were continually exploring new sources of trade, and were found in every spot where business could be transacted.

To this extensive and incessant application to commerce, they added an equal vigilance in the administration of their affairs at home. Whatever could conduce to the amelioration of the soil they possessed, to the progress of agriculture, or to the improvement of their domestic circumstances, was attended to with so much labour and care, that it may be strictly said that Nature had given them nothing of which they did not make the most.

In the midst of this solicitude and toil in matters of business, the affairs of government were conducted with steadiness, prudence, and lenity, seldom experienced, and never exceeded, in the best regulated countries of Europe.

Such was the situation of the British colonies in general throughout North America, and of the New-England provinces in particular, when the pacification above-

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above-mentioned opened one of the most remarkable scenes that ever commanded the attention of the world.

127 Intrigues of the French supposed by English writers to be the origin of the American war.

In treating of the American revolution, it has become a fashion with the English writers to ascribe that event to the successful intrigues of the French government. Instead of contemplating it, with the characteristic philosophy of their country, as the result of a contest between the desire of power, and the abhorrence of oppression, they have sought the origin of the evil in any source rather than their own misconduct; and have endeavoured at once, to hush the reproaches of their political conscience, and to gratify the cravings of their national animosity, in wild conjectures of a scheme formed by their neighbours to divide the British Empire, and in declamatory invectives against the Gallic faith and honour. Thus it has been repeatedly asserted, that the French having long viewed, with equal envy and apprehension, the flourishing state of the colonies which Britain had founded in America, began immediately after the peace of Paris to carry into execution their project for separating those colonies from the mother country. Secret emissaries, it is said were employed in spreading dissatisfaction among the colonists; and the effects produced by these machinating spirits are described to have been a rapid diminution of that peculiar warmth of attachment, which the inhabitants of North-America had hitherto demonstrated for the mother country; the excitement of a jealousy which led them to view her rather in the light of a sovereign than of a parent; and the introduction of a hostile policy which taught them to examine, with a scrupulous nicety, the nature of those ties that rendered them parts of her empire. That such emissaries were ever employed, is a fact unsupported by any document which the purity of historical truth can admit; and although the effects here described, have certainly appeared, it must be remembered that their appearance followed, but did not precede, the attempts of Britain upon the rights and liberties of America. By mere artifice and address to have alienated the affections of the colonists from their mother country, at the close of a war in which their interests and feelings had been interwoven with more than usual strength and energy, was a task of infinite difficulty; not surely to be accomplished in the short period between the declaration of peace in 1761, and the promulgation of the first obnoxious acts of the British parliament in 1764. But, if we trace these effects to another cause, to a love of liberty, and a quick sense of injury, their appearance will be natural and just; consistent with the American character, and corresponding with the conduct which was displayed in all the vicissitudes that attended the revolt.

128 Taxes laid on goods imported into the colonies, and other obnoxious acts framed;

In March, 1764, a bill was passed, by which heavy duties were laid on goods imported by the colonists from such West-India Islands as did not belong to Great Britain; at the same time that these duties were to be paid into the exchequer in specie: and in the same session, another bill was framed to restrain the currency of paper-money in the colonies themselves. Not only the principle of taxation, but the mode of collection was considered as an unconstitutional and oppressive innovation; for the penalties incurred by an infraction of the acts of parliament, might be recovered in the courts of admiralty, before a single judge (whose salary was the fruit of the forfeitures he decreed) without trial by jury, or any of the other benefits of common law jurisprudence. These acts coming so close to each other

129 Which exasperate the Americans.

threw the whole continent into the utmost ferment. Vehement remonstrances were made to the ministry, and every argument made use of that reason or ingenuity could suggest, but to no purpose. Their reasoning, however, convinced a great number of people in Britain; and thus the American cause came to be considered as the cause of liberty.

The Americans, finding all argumentation vain, at last united in an agreement to import no more of the manufactures of Great Britain, but to encourage to the utmost of their power every thing of that kind among themselves. Thus the British manufacturers also became a party against the ministry, and did not fail to express their resentment in the strongest terms; but the ministry were not to be so easily daunted, and therefore proceeded to the last step of their intended

130 The stamp act framed.

plan, which was to lay on stamp duties throughout the continent. Previous to this, indeed, several regulations were passed in favour of the commerce of the colonies; but they had now imbibed such unfavourable sentiments of the British ministry, that they paid very little regard to any thing pretended to be done in their favour; or if these acts made any favourable impression, it was quickly obliterated by the news of the stamp-act. The reason given for this act, so exceedingly obnoxious, was, that a sum might be raised sufficient for the defence of the colonies against a foreign enemy; but this pretence was so far from giving any satisfaction to the Americans, that it excited their indignation to the utmost degree. They not only asserted that they were abundantly able to defend themselves against any foreign enemy, but denied that the British parliament had any right to tax them at all.

It would be superfluous to enter into any arguments used by the contending parties on this important occasion. It was evident that the matter was not to be decided by argument, but by force of arms; and the British ministry, too confident of the authority and power of that country, determined to carry on matters with an high hand, to terrify the colonists into an implicit subjection, or, if that would not do, to compel

131 Received with universal indignation in America.

them to it by force. The stamp-act, after a violent opposition in parliament, was passed, and its reception in America was such as might have been expected. The news, and the act itself, first arrived at Boston, where the bells were muffled and rung a funeral peal. The act was first hawked about the streets with a Death's head, affixed to it, and styled the "Folly of England, and the Ruin of America;" and afterwards publicly burnt by the enraged populace: The stamps themselves were seized and destroyed, unless brought by men of war, or kept in fortified places; those who were to receive the stamp duties were compelled to resign their offices: and such of the Americans as sided with government on this occasion, had their houses plundered and destroyed.

Though these outrages were committed by the multitude, they were first connived at by those of superior rank, and the principles on which they were founded afterwards openly patronized by them; and the doctrine

America.

them; and the doctrine became general and openly avowed, that Britain had no right whatever to tax the colonies without their own consent.

It was now found absolutely necessary either to yield to the Americans, by repealing the obnoxious statutes, or to enforce them by arms. The ferment had diffused itself universally throughout the colonies. Virginia first, and after that all the rest of the provinces, declared against the ri ht of Britain to lay on taxes in America; and that every attempt to vest others with this power besides the king, or the governor of the province and his general assembly, was illegal, unconstitutional, and unjust. Non-importation agreements were every where entered into; and it was even resolved to prevent the sale of any more British goods after the present year. American manufactures, though dearer, as well as inferior in quality to the British, were universally preferred. An association was entered into against eating of lamb, in order to promote the growth of wool; and the ladies with chearfulness agreed to renounce the use of every species of ornament manufactured in Britain. Such a general and alarming confederacy determined the ministry to repeal some of the most obnoxious statutes; and to this they were the more inclined by a petition from the first American congress, held at New York in the beginning of October 1765.

132 Repealed.

The stamp-act was therefore repealed, to the universal joy of the Americans, and indeed to the general satisfaction of the English, whose manufactures had begun to suffer very severely in consequence of the American association against them. The disputes on the subject without doors, however, were by no means silenced, but each party continued to argue the case as violently as ever. The celebrated Dr Benjamin Franklin was, on this occasion examined before the House of Commons; and his opinion was in substance as follows:

133 Opinion of Dr Franklin on this subject.

"That the tax in question was impracticable and ruinous. The very attempt had so far alienated the affection of the colonies, that they behaved in a less friendly manner towards the natives of England than before; considering the whole nation as conspiring against their liberty, and the parliament as willing rather to oppress than to support and assist them. America, in fact, did not stand in any need of British manufactures, having already begun to construct such as might be deemed absolutely necessary, and that with such success, as left no doubt of their arriving in a short time at perfection. The elegancies of dress had already been renounced for manufactures of the American kind, though much inferior; and the bulk of the people, consisting of farmers, were such as could in no way be affected by the want of British commodities, as having every necessary within themselves. Materials of all kinds were to be had in plenty: the wool was fine; flax grew in great abundance; and iron was every where to be met with."

The Doctor also insisted, That "the Americans had been greatly misrepresented; that they had been traduced as void of gratitude and affection for the parent state; than which nothing could be more contrary to truth. In the war of 1755 they had, at their own expence, raised an army of 25,000 men; and in that of 1739, they assisted the British expeditions against South-America with several thousand men, and had made many brave exertions against the French in North-America. It was said that the war of 1755 had been undertaken in defence of the colonies; but the truth was, that it originated from a contest about the limits between Canada and Nova-Scotia, and in defence of the English rights to trade on the Ohio. The Americans, however, would still continue to act with their usual fidelity; and, were any war to break out in which they had no concern, they would show themselves as ready as ever to assist the parent state to the utmost of their power, and would never fail to manifest their readiness in contributing to the emergencies of government, when called to do so in a regular and constitutional manner."

134 Declaratory bill gives offence in America.

The ministry were conscious, that in repealing this obnoxious act, they yielded to the Americans; and therefore, to support, as they thought, the dignity of Great Britain, it was judged proper to publish a declaratory bill, setting forth the authority of the mother-country over her colonies, and her power to bind them by laws and statutes *in all cases whatever*. This much diminished the joy with which the repeal of the stamp-act was received in America. It was considered as a proper reason to enforce any claims equally prejudicial with the stamp-act, which might hereafter be set up; a spirit of jealousy pervaded the whole continent, and a strong party was formed, watchful on every occasion to guard against the encroachments of the British power.

135 Assembly of New York disobeys an act of parliament.

It was not long before an occasion offered, in which the Americans manifested a spirit of independency; and that, instead of being bound by the British legislature in all cases, they would not be controuled by it in the most trivial affairs. The Rockingham ministry had passed an act, providing the troops stationed in different parts of the colonies with such accommodations as were necessary for them. The assembly of New York, however, took upon them to alter the mode of execution prescribed by the act of parliament, and to substitute one of their own. This gave very great offence to the new ministry, and rendered them, though composed of those who had been active against the stamp-bill, less favourable to the colonies than in all probability they would otherwise have been. An unlucky circumstance at the same time occurred, which threw every thing once more into confusion.

136 Mr Townshend's plan to tax America.

One of the new ministry, Mr Charles Townshend, having declared that he could find a way of taxing the Americans without giving them offence, was called upon to propose his plan. This was by imposing a duty upon tea, paper, painters colours, and glass imported into America The conduct of the New York assembly, respecting the troops, and that of Boston, which had proceeded in a similar manner, caused this bill to meet with less opposition than otherwise it might have done. As a punishment to the refractory assemblies, the legislative power was taken from that of New York, until it should fully comply with the terms of the act. That of Boston at last submitted with reluctance. The bill for the new taxes was quickly passed, and sent to America in 1768.

137 Is received there with still greater indignation than ever the stamp-act.

A ferment much greater than that occasioned by the stamp-act now took place throughout the continent. The populace renewed their outrages, and those of superior station entered into regular associations against it

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it. Circular letters were sent from Massachusetts colony to all the rest, setting forth the injustice and impropriety of the behaviour of the British legislature. Meetings were held in all the principal towns, in which it was proposed to lessen the consumption of foreign manufactures, by giving proper encouragement to their own. Continual disputes ensued betwixt the governors and general assemblies of their provinces, which were much heightened by a letter from lord Shelburne to governor Bernard of Massachusetts-Bay, containing complaints of the people he governed. The assembly exasperated to the highest degree, charged their governor with having misrepresented them to the court of Britain, required him to produce copies of the letters he had sent; and, on his refusal, wrote letters to the English ministry, accusing him of misrepresentation and partiality, complaining at the same time most grievously of the proceedings of parliament, as utterly subversive of the liberties of America, and the rights of British subjects.

138 Quarrel between the people of Massachusetts-Bay and their governor.

The governor, at a loss how to defend himself, prorogued the assembly; and, in his speech on the occasion, gave a loose to his resentment, accusing the members of ambitious designs, incompatible with those of dutiful and loyal subjects. To counteract the circular letter of the province of Massachusetts-Bay, Lord Hillsborough, secretary for the American department, sent another to the governors of the different colonies, reprobating the other as full of misrepresentation, and tending to excite a rebellion against the authority of the parent state.

Matters now hastened to a crisis. The governor had been ordered to proceed with vigour, and by no means to show any disposition to yield to the people as formerly. In particular, they were required to rescind that resolution by which they had written the circular letter abovementioned; and, in case of a refusal, it was told them that they would be dissolved. As this letter had been framed by the resolutions of a former House, they desired, after a week's consultation, that a recess might be granted to consult with their constituents; but this being refused, they came to a determination, 92 against 17, to adhere to the resolution which produced the circular letter. At the same time a letter was sent to Lord Hillsborough, and a message to the governor, in justification of their proceedings. In both they expressed themselves with such freedom as was by no means calculated to accord with the sentiments of those in power. They insisted that they had a right to communicate their sentiments to their fellow-subjects upon matters of such importance; complained of the requisition to rescind the circular letter as unconstitutional and unjust; and particularly insisted, that they were represented as harbouring seditious designs, when they were doing nothing but what was lawful and right. At the same time they condemned the late acts of parliament as highly oppressive, and subversive of liberty. The whole was concluded by a list of accusations against their governor, representing him as unfit to continue in his station, and petitioning the king for his removal from it.

139 He requires the assembly to rescind their circular letter;

Which they refuse.

140 Accuse their governor, and petition for his removal.

These proceedings were followed by a violent tumult at Boston. A vessel belonging to a capital trader had been seized in consequence of his having neglected some of the new regulations; and being taken under the protection of a man of war at that time lying in the harbour, the populace attacked the houses of the commissioners of excise, broke their windows, destroyed the collector's boats, and obliged the customhouse officers to take refuge in Castle William, situated at the entrance of the harbour.

141 A tumult at Boston.

The governor now took the last step in his power to put a stop to the violent proceedings of his assembly, by dissolving it entirely; but this was of little moment. Their behaviour had been highly approved by the other colonies, who had written letters to them expressive of their approbation. After the dissolution of the assembly, frequent meetings of the people were held in Boston, which ended in a remonstrance to the governor, to the same purpose as some of the former; but concluding with a request, that he would take upon him to order the king's ships out of the harbour.

142 The assembly dissolved.

While the disposition of the Bostonians was thus more and more irritated, news arrived that the agent for the colony had not been allowed to deliver their petition to the king; it having been objected, that the assembly without the governor was not sufficient authority. This did not contribute to allay the ferment; and it was further augmented by the news that a number of troops had been ordered to repair to Boston, to keep the inhabitants in awe.

143 The disturbances still increase.

144 Some troops ordered to Boston.

A dreadful alarm now took place. The people called on the governor to convene a general assembly, in order to remove their fears of the military; who, they said, were to be assembled to overthrow their liberties, and force obedience to laws to which they were entirely averse. The governor replied, it was no longer in his power to call an assembly; having, in his last instructions from England, been required to wait the king's orders, the matter being then under consideration at home. Being thus refused, the people took upon themselves the formation of an assembly, which they called a *convention*. The proceedings and resolutions of this body naturally partook of the temper and disposition of the late assembly; but they went a step farther, and having voted "that there is apprehension in the minds of many of an approaching rupture with France," requested the inhabitants to put themselves in a posture of defence against any sudden attack of an enemy; and circular letters were directed to all the towns in the province, acquainting them with the resolutions that had been taken in the capital, and exhorting them to proceed in the same manner. The town of Hatfield alone refused its concurrence. The convention, however, thought proper to assure the governor of their pacific intentions, and renewed their request that an assembly might be called; but being refused any audience, and threatened with being treated as rebels, they at last thought proper to dissolve of themselves, and sent over to Britain a circumstantial account of their proceedings, with the reason of their having assembled in the manner already mentioned.

145 The people form an assembly called a *Convention*;

146 Which dissolves, and vindicates its own conduct.

The expected troops arrived on the very day on which the convention broke up, and had some houses in the town fitted up for their reception. Their arrival had a considerable influence on the people, and for some time seemed to put a stop to the disturbances; but the spirit of the people was now so much roused, that it

was

America.

was impoſſible to quench the flame. The late outrageous behaviour in Boſton had given the greateſt offence in England;

147 Both houſes of parliament addreſs the king againſt America,

and, notwithſtanding all the efforts of oppoſition, an addreſs from both houſes of parliament was preſented to the king; in which the behaviour of the colony of Maſſachuſetts-Bay was ſet forth in the moſt ample manner, and the moſt vigorous meaſures recommended for reducing them to obedience. The Americans, however, continued ſtedfaſt in the ideas they had adopted. Though the troops had for ſome time quieted the diſturbances, yet the calm continued no longer than they appeared reſpectable on account of their number; but as ſoon as this was diminiſhed by the departure of a large detachment, the remainder were treated with contempt, and it was even reſolved to expel them altogether. The country people took up arms for this purpoſe, and were to have aſſiſted their friends in Boſton; but before this deſign could be put in execution, an event happened which put an end to every idea of reconciliation betwixt the contending parties.

148 Some people killed by the ſoldiers in a mob at Boſton.

On the 5th of March 1770, a ſcuffle happened between the ſoldiers and a party of the town's people. The inhabitants poured in from all quarters to the aſſiſtance of their fellow-citizens: a violent tumult enſued, during which the military fired upon the mob, killing and wounding ſeveral of them. The whole province now roſe in arms, and the ſoldiers were obliged to retire to Caſtle William to prevent their being cut in pieces. Let it be remembered, however, to the praiſe of American virtue, that, on the trial, notwithſtanding popular prejudice and apprehenſion, the captain and ſix of the men were acquitted, two men only being found guilty of manſlaughter.

149 All the duties excepting that on tea taken off;

In other reſpects the determinations of the Americans continued, if poſſible, more firm than ever, until at laſt government, determining to act with vigour, and at the ſame time to behave with as much condeſcenſion as poſſible, without abandoning their principles, repealed all the duties lately laid on, that of tea alone excepted. This was left on purpoſe to maintain the dignity of the crown of Britain; and it was thought that it could not be productive of any diſcontent in America, as being an affair of very little moment, the produce of which was not expected to exceed L.16,000. The oppoſition, however, were ſtrenuous in their endeavours to get this tax likewiſe abrogated; inſiſting that the Americans would conſider it only as inlet to others; and that the repeal of all the reſt, without this, would anſwer no good purpoſe.

150 Which is as violently oppoſed as all the reſt.

The event ſhewed that their opinion was well founded. The Americans oppoſed the tea-tax with the ſame violence as they had done all the reſt: and at laſt, on the news that ſalaries had been ſettled on the juſtices of the ſuperior court at Boſton, the governor was addreſſed on the ſubject; the meaſure was condemned in the ſtrongeſt terms; and a committee ſelected out of the ſeveral diſtricts of the colony appointed to inquire into it.

151 Aſſembly of Maſſachuſetts-Bay formally denies the Britiſh right of taxation.

The new aſſembly proceeded in the moſt formal manner to diſavow the ſupremacy of the Britiſh legiſlature; and accuſed the parliament of Britain of having violated the natural rights of the Americans in a number of inſtances. Copies of the tranſactions of this aſſembly were tranſmitted to every town in Maſſachuſetts, exhorting the inhabitants to rouſe themſelves, and exert every nerve in oppoſition to the iron hand of oppreſſion, which was daily tearing the choiceſt fruits from the fair tree of liberty.

152 Gov. Hutchinſon's letters to the Britiſh miniſtry diſcovered.

The diſturbances were alſo greatly heightened by an accidental diſcovery that Mr Hutchinſon, governor of Maſſachuſetts-Bay, had written ſeveral confidential letters to people in power in England, complaining of the behaviour of the province, recommending vigorous meaſures againſt them, and, among other things, aſſerting, that "there muſt be an abridgement of what is called Britiſh liberty." Letters of this kind had fallen into the hands of the agent for the colony at London. They were immediately tranſmitted to Boſton, where the aſſembly was ſitting, by whom they were laid before the governor, who was thus reduced to a very mortifying ſituation.

153 The petition againſt him refuſed.

Loſing every idea of reſpect or friendſhip for him as their governor, they inſtantly diſpatched a petition to the king, requeſting him to remove the governor and deputy-governor from their places, but to this they not only received no favourable anſwer, but the petition itſelf was declared groundleſs and ſcandalous.

Matters were now ripe for the utmoſt extremities on the part of the Americans; and they were brought on in the following manner. Though the colonies had entered into a non-importation agreement againſt tea as well as all other commodities from Britain, it had nevertheleſs found its way into America, though in ſmaller quantities than before. This was ſenſibly felt by the Eaſt-India Company, who had now agreed to pay a large ſum annually to government in recompence for which compliance, and to make up their loſſes in other reſpects, they were empowered to export their tea free from any duty payable in Britain; and in conſequence of this premiſſion, ſeveral ſhips freighted with the commodity were ſent to North-America, and proper agents appointed for diſpoſing of it. The Americans now perceiving that the tax was thus likely to be enforced whether they would or not, determined to take every poſſible method to prevent the tea from being landed, as well knowing that it would be impoſſible to hinder the ſale, ſhould the commodity once be brought on ſhore. For this purpoſe the people aſſembled in great numbers, forcing thoſe to whom the tea was conſigned to reſign their offices, and to promiſe ſolemnly never to reſume them; and committees were appointed to examine the accounts of merchants, and make public teſts, declaring ſuch as would not take them enemies to their country. Nor was this behaviour confined to the colony of Maſſachuſetts-Bay; the reſt of the provinces entered into the conteſt with the ſame warmth, and manifeſted the ſame reſolution to oppoſe this invaſion of their rights.

In the midſt of this confuſion, three ſhips laden with tea arrived in Boſton; but ſo much were the captains alarmed at the diſpoſition which ſeemed to prevail among the people, that they offered, providing they could obtain the proper diſcharges from the tea-conſignees, cuſtom-houſe, and governor, to return to Britain without landing their cargoes. The parties concerned, however, though they durſt not order the tea to be landed, refuſed to grant the diſcharges required. The ſhips, therefore, would have been obliged to remain in the harbour; but the people apprehenſive

America. that if they remained there, the tea would be landed in small quantities and disposed of in spite of every endeavour to prevent it, resolved to destroy it at once.

154 Tea destroyed at Boston. This resolution was executed with equal speed and secresy. The very evening after the abovementioned discharges had been refused, a number of people dressed like Mohawk Indians boarded the ships, and threw into the sea their whole cargoes, consisting of 342 chests of tea; after which they retired without making any further disturbance, or doing any other damage.

155 And refused admittance in other places. No tea was destroyed in other places, though the same spirit was every where manifested. At Philadelphia the pilots were enjoined not to conduct the vessels up the river; and at New-York, though the governor caused some tea to be landed under the protection of a man of war, he was obliged to deliver it up to the custody of the people to prevent its being sold.

The destruction of the tea at Boston, which happened in November 1773, was the immediate prelude to the disasters attending civil discord. Government finding themselves every where insulted and despised, resolved to enforce their authority by all possible means; and as Boston had been the principal scene of the riots and outrages, it was determined to punish that city in an exemplary manner. Parliament was acquainted by a message from his majesty with the undutiful behaviour of the city of Boston, as well as of all the colonies, recommending at the same time the most vigorous and spirited exertions to reduce them to obedience. The parliament in its address promised a ready

156 Punishment of Boston resolved on. compliance; and, indeed, the Americans seemed now to have lost many of their partisans. It was proposed to lay a fine on the town of Boston equal to the price of the tea which had been destroyed, and to shut up its port by armed vessels until the refractory spirit of the inhabitants should be subdued; which, it was thought, must quickly yield, as a total stop would thus be put to

157 Arguments and petitions against it. their trade. The bill was strongly opposed on the same grounds that the other had been; and it was predicted, that, instead of having any tendency to reconcile or subdue the Americans, it would infallibly exasperate them beyond any possibility of a reconciliation. The petitions against it, presented by the colony's agent, pointed out the same consequence in the strongest terms, and in the most positive manner declared that the Americans never would submit to it; but such was the infatuation attending every rank and degree of men, that it never was imagined the Americans would dare to resist

158 And for the impartial administration of justice. the parent state openly, but would in the end submit implicitly to her commands. In this confidence, a third bill was proposed for the impartial administration of justice on such persons as might be employed in the suppression of riots and tumults in the province of Massachusetts-Bay. By this act it was provided, that should any persons acting in that capacity be indicted for murder, and not able to obtain a fair trial in the province, they might be sent by the governor to England, or to some other colony, if necessary, to be tried for the supposed crime.

159 Quebec bill. These three bills having passed so easily, the ministry proposed a fourth, relative to the government of Canada; which, it was said, had not yet been settled on any proper plan. By this bill the extent of that province was greatly enlarged; its affairs were put under the direction of a council in which Roman Catholics were to be admitted; the Roman Catholic clergy were secured in their possessions and the usual perquisites from those of their own profession. The council abovementioned were to be appointed by the crown; to be removeable at its pleasure; and to be invested with every legislative power, excepting that of taxation.

160 These acts exasperate the Americans. No sooner were these laws made known in America, than they cemented the union of the colonies almost beyond any possibility of dissolving it. The assembly of Massachusetts-Bay had passed a vote against the judges accepting salaries from the crown, and put the question, Whether they would accept them as usual from the general assembly? Four answered in the affirmative; but Peter Oliver, the chief-justice, refused. A petition against him, and an accusation, were brought before the governor; but the latter refused the accusation, and declined to interfere in the matter; but as they still insisted for justice against Mr Oliver, the governor thought proper to put an end to the matter by dissolving the assembly.

161 Resentment occasioned by the port-bill. In this situation of affairs, a new alarm was occasioned by the news of the port-bill. This had been totally unexpected, and was received with the most extravagant expressions of displeasure among the populace, and while these continued, the new governor, General Gage, arrived from England. He had been chosen to this office on account of his being well acquainted in America, and generally agreeable to the people; but human wisdom could not now point out a method by which the flame could be allayed. The first act of his office as governor was to remove the assembly to Salem, a town 17 miles distant, in consequence of the late act. When this was intimated to the assembly, they replied by requesting him to appoint a day for public humiliation for deprecating the

162 Proceedings of the general assembly met at Salem. wrath of heaven, but met with a refusal. When met at Salem, they passed a resolution, declaring the necessity of a general congress composed of delegates from all the provinces, in order to take the affairs of the colonies at large into consideration: and five gentlemen remarkable for their opposition to the British measures, were chosen to represent that of Massachusetts-Bay. They then proceeded with all expedition to draw up a declaration, containing a detail of the grievances they laboured under, and the necessity of exerting themselves against lawless power; they set forth the disregard shown to their petitions, and the attempts of Great Britain to destroy their ancient constitution; and concluded with exhorting the inhabitants of the colony, to obstruct, by every method in their power, such evil designs, recommending at the same time a total renunciation of every thing imported from Great-Britain, till a redress of grievances could be procured.

163 Generosity of the people of Salem to those of Boston. Intelligence of this declaration was carried to the governor on the very day that it was completed; on which he dissolved the assembly. This was followed by an address from the inhabitants of Salem in favour of those of Boston, and concluding with these remarkable words: "By shutting up the port of Boston, some imagine that the course of trade might be turned hither, and to our benefit; but nature, in the formation of our harbour, forbids our becoming rivals in commerce with that convenient mart; and were it otherwise,

America.

otherwise, we must be dead to every idea of justice, lost to all feelings of humanity, could we indulge one thought to seize on wealth, and raise our fortunes on the ruin of our suffering neighbours."

It had been fondly hoped by the ministerial party at home, that the advantages which other towns of the colony might derive from the annihilation of the trade of Boston, would make them readily acquiesce in the measure of shutting up that port, and rather rejoice in it than otherwise; but the words of the address abovementioned seemed to preclude all hope of this kind; and subsequent transactions soon manifested it to be totally vain. No sooner did intelligence arrive of the remaining bills passed in the session of 1774, than the cause of Boston became the cause of all the colonies. The port-bill had already occasioned violent commotions throughout them all. It had been reprobated in provincial meetings, and resistance even to the last had been recommended against such oppression. In Virginia, the first of June, the day on which the port of Boston was to be shut up, was held as a day of humiliation, and a public intercession in favour of America was enjoined. The style of the prayer enjoined at this time was, that "God would give the people one heart and one mind, firmly to oppose every invasion of the American rights." The Virginians, however, did not content themselves with acts of religion. They recommended in the strongest manner a general congress of all the colonies, as fully persuaded that an attempt to tax any colony in an arbitrary manner was in reality an attack upon them all, and must ultimately end in the ruin of them all.

164 The cause of Boston espoused by all the rest of the colonies.

The provinces of New-York and Pensylvania, however, were less sanguine than the rest, being so closely connected in the way of trade with Great Britain, that the giving it up entirely appeared a matter of the most serious magnitude, and not to be thought of but after every other method had failed. The intelligence of the remaining bills respecting Boston, however, spread a fresh alarm throughout the continent, and fixed those who had seemed to be the most wavering. The proposal of giving up all commercial intercourse with Britain was again proposed; contributions for the inhabitants of Boston were raised in every quarter; and they every day received addresses commending them for the heroic courage with which they sustained their calamity.

165 The Americans firmly united in their opposition to Britain.

The Bostonians on their part were not wanting in their endeavours to promote the general cause. An agreement was framed, which in imitation of former times, they called a Solemn League and Covenant. By this the subscribers most religiously bound themselves to break off all communication with Britain after the expiration of the month of August ensuing, until the obnoxious acts were repealed; at the same time they engaged neither to purchase nor use any goods imported after that time, and to renounce all connection with those who did, or who refused to subscribe to this covenant; threatening to publish the names of the refractory; which at this time was a punishment by no means to be despised. Agreements of a similar kind were almost instantaneously entered into throughout all America. General Gage indeed attempted to counteract the covenant by a proclamation, wherein it was declared an illegal and traiterous combination, threatening with the pains of law such as subscribed or countenanced it. But matters were too far gone for his proclamations to have any effect. The Americans retorted the charge of illegality on his own proclamation, and insisted that the law allowed subjects to meet in order to consider of their grievances, and associate for relief from oppression.

166 Solemn league and covenant formed at Boston.

167 The governor attempts in vain to counteract it by proclamation.

Preparations were now made for holding the general congress so often proposed. Philadelphia, as being the most central and considerable town, was pitched upon for the place of its meeting. The delegates, of whom it was to be composed, were chosen by the representatives of each province, and were in number from two to seven for each colony, though no province had more than one vote. The first congress, which met at Philadelphia, in the beginning of September 1774, consisted of 51 delegates. The novelty and importance of the meeting excited and universal attention; and their transactions were such as could not but tend to render them respectable.

168 Congress meets at Philadelphia.

The first act of congress was an approbation of the conduct of Massachusetts-Bay, and an exhortation to continue in the same spirit with which they had begun. Supplies for the suffering inhabitants (whom the operation of the port-bill had reduced to great distress) were strongly recommended; and it was declared, that in case of attempts to enforce the obnoxious acts by arms, all America should join to assist the town of Boston; and, should the inhabitants be obliged, during the course of hostilities, to remove further up the country, the losses they might sustain should be repaired at the public expence.

169 Account of its transactions.

They next addressed General Gage by letter; in which, having stated the grievances of the people of Massachusetts colony, they informed him of the fixed and unalterable determination of all the other provinces to support their brethren and to oppose the British acts of parliament; that they themselves were appointed to watch over the liberties of America; and intreated him to desist from military operations, lest such hostilities might be brought on as would frustrate all hopes of reconciliation with the parent state.

The next step was to publish a declaration of their rights. These they summed up in the rights belonging to Englishmen; and particularly insisted, that as their distance rendered it impossible for them to be represented in the British parliament, their provincial assemblies, with the governor appointed by the king, constituted the only legislative power within each province. They would, however, consent to such acts of parliament as were evidently calculated merely for the regulation of commerce, and securing to the parent state the benefits of the American trade; but would never allow that they could impose any tax on the colonies, for the purpose of raising a revenue, without their consent. They proceeded to reprobate the intention of each of the new acts of parliament; and insisted on all the rights they had enumerated as being unalienable, and what none could deprive them of. The Canada act they particularly pointed out as being extremely inimical to the colonies, by whose assistance it had been conquered; and they termed it "An act for establishing the Roman Catholic religion in Canada, abolishing the equitable system of English laws, and establishing a tyranny there." They further declared

clared in favour of a non-importation and non-consumption of British goods, until the acts were repealed by which duties were imposed upon tea, coffee, wine, sugar, and molasses, imported into America, as well as the Boston port-act, and the three others passed in the preceding session of parliament. The new regulations against the importation and consumption of British commodities were then drawn up with great solemnity; and they concluded with returning the warmest thanks to those members of parliament who had, with so much zeal, though without any success, opposed the obnoxious acts of parliament.

Their next proceedings were, to frame a petition to the king, an address to the British nation, and another to the colonies; all of which were so much in the usual spirited strain of American language for some time past, that it is needless to enter into any particular account of them. It is sufficient to say, that they were all drawn up in a masterly manner, and ought to have impressed the people of England with a more favourable idea of the Americans than they could at that time be induced to entertain.

All this time the disposition of the people had corresponded with the warmest wishes of congress. The first of June had been kept as a fast, not only throughout Virginia, where it was first proposed, but through the whole continent. Contributions for the distresses of Boston had been raised throughout America, and people of all ranks seemed to be particularly touched with them. Even those who seemed to be most likely to derive advantage from them, took no opportunity, as has been already instanced in the case of Salem.

170 Generosity of the inhabitants of Marblehead to Boston.

The inhabitants of Marblehead also showed a noble example of magnanimity in the present case. Though situated in the neighbourhood of Boston, and most likely to derive benefit from their distresses, they did not attempt to take any advantage, but generously offered the use of their harbour to the Bostonians, as well as their wharfs and warehouses, free of all expence. In the mean time the British forces at Boston were continually increasing in number, which greatly augmented the general jealousy and dissatisfaction; the country were ready to raise at a moment's warning;

171 Extreme attachment of the country people to the Bostonians.

and the experiment was made by giving a false alarm that the communication between the town and country was to be cut off, in order to reduce the former by famine to a compliance with the acts of parliament. On this intelligence, the country people assembled in great numbers, and could not be satisfied until they had sent messengers into the city to enquire into the truth of the report. These messengers were enjoined to inform the town's people, that if they should be so pusillanimous as to make a surrender of their liberties, the province would not think itself bound by such examples; and that Britain, by breaking their original charter, had annulled the contract subsisting between them, and left them to act as they thought proper.

The people in every other respect manifested their inflexible determination to adhere to the plan they had so long followed. The new counsellors and judges were obliged to resign their offices, in order to preserve their lives and properties from the fury of the multitude. In some places they shut up the avenues to the court-houses; and, when required to make way for the judges, replied, that they knew of none but such as were appointed by the ancient usage and custom of the province. Every where they manifested the most ardent desire of learning the art of war; and every individual who could bear arms, was most assiduous in procuring them, and learning their exercise.

172 Gen. Gage fortifies Boston Neck,

Matters at last proceeded to such an height, that General Gage thought proper to fortify the neck of land which joins the town of Boston to the continent. This, though undoubtedly a prudent measure in his situation, was exclaimed against by the Americans in the most vehement manner; but the General, instead of giving ear to their remonstrances, deprived them of all power of acting against himself,

173 And seizes the military stores belonging to the province.

by seizing the provincial powder, ammunition, and military stores at Cambridge and Charlestown. This excited such indignation, that it was with the utmost difficulty the people could be restrained from marching to Boston and attacking the troops. Even in the town itself, the company of cadets that used to attend him disbanded themselves, and returned the standard he had as usual presented them with on his accession to the government. This was occasioned by his having deprived the celebrated patriot John Hancock, afterwards president of the congress, of his commission as colonel of the cadets. A similar instance happened of a provincial colonel having accepted a seat in the new council; upon which 24 officers of his regiment resigned their commissions in one day.

174 Opposition to the British parliament still increases.

In the mean time a meeting was held of the principal inhabitants of the towns adjacent to Boston. The purport of this was publicly to renounce all obedience to the late acts of parliament, and to form an engagement to indemnify such as should be prosecuted on that account; the members of the new council were declared violators of the rights of their country; all ranks and degrees were exhorted to learn the use of arms; and the receivers of the public revenue were ordered not to deliver it into the treasury, but to retain it in their own hands till the constitution should be restored, or a provincial congress dispose of it otherwise.

A remonstrance against the fortifications on Boston Neck was next prepared; in which, however, they still declared their unwillingness to proceed to any hostile measures; asserting only as usual their firm determination not to submit to the acts of parliament they had already so much complained of.

175 A general assembly called and dissolved by proclamation.

The governor, to restore tranquillity, if possible, called a general assembly; but so many of the council had resigned their seats, that he was induced to countermand its sitting by proclamation. This measure, however, was deemed illegal; the assembly met at Salem; and, after waiting a day for the governor, voted themselves into a provincial congress, of which Mr Hancock was chosen president. A committee was instantly appointed, who waited on the governor with a remonstrance concerning the fortifications on Boston Neck; but nothing of consequence took place, both parties mutually criminating each other. The winter was now coming on, and the governor,

176 Gen. Gage meets with great difficulties in accommodating his troops.

to avoid quartering the soldiers upon the inhabitants, proposed to erect barracks for them; but the select-men of Boston compelled the workmen to desist. Carpenters were sent for to New-York, but they were refused; and it was with the utmost difficulty that he could procure winter-lodgings for his troops. Nor was the difficulty less in procuring clothes; as the merchants

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chants of New-York told him, that they would never ſupply any article for the benefit of men ſent as enemies to their country."

177 The Americans make preparations for war.

This diſpoſition, known to be almoſt univerſal throughout the continent, was in the higheſt degree ſatisfactory to congreſs. Every one ſaw that the enſuing ſpring was to be the ſeaſon of commencing hoſtilities, and the moſt indefatigable diligence was uſed by the colonies to be well provided againſt ſuch a formidable enemy. A liſt of all the fenſible men in each colony was made out, and eſpecially of thoſe who had ſerved in the former war; of whom they had the ſatiſfaction to find that two-thirds were ſtill alive and fit to bear arms. Magazines of arms were collected, and money was provided for the payment of troops. The governors in vain attempted to put a ſtop to theſe proceedings by proclamations; the fatal period was now arrived: and the more the ſervants of government attempted to repreſs the ſpirit of the Americans, the more determined it appeared.

178 Diſtreſs of the inhabitants of Boſton.

In the mean time the inhabitants of Boſton were reduced to great diſtreſs. The Britiſh troops, now diſtinguiſhed by the name of the *enemy*, were abſolutely in poſſeſſion of it; the inhabitants were kept as priſoners, and might be made accountable for the conduct of the whole colonies; and various meaſures were contrived to relieve the latter from ſuch a diſagreeable ſituation. Sometimes it was thought expedient to remove the inhabitants altogether; but this was impracticable without the governor's conſent. It was then propoſed to ſet fire to the town at once, after valuing the houſes and indemnifying the proprietors; but this being found equally impracticable, it was reſolved to wait ſome other opportunity, as the garriſon were not very numerous, and, not being ſupplied with neceſſaries by the inhabitants, might ſoon be obliged to leave the place. The friends of Britiſh government indeed attempted to do ſomething in oppoſition to the general voice of the people; but after a few ineffectual meetings and reſolutions, they were utterly ſilenced, and obliged to yield to the ſuperior number of the patriots.

Matters had now proceeded ſo far that the proſpect of reconciliation or friendſhip with Britain became daily more and more diſtant. The Americans, therefore, began to ſeize on the military ſtores and ammunition belonging to government. This firſt com-

179 Military ſtores ſeized by the Americans

menced at New-port in Rhode-Iſland, where the inhabitants carried off 40 pieces of cannon appointed for the protection of the place; and on being aſked the reaſon of this proceeding, they replied, that the people had ſeized them leſt they ſhould be made uſe of againſt themſelves. After this the aſſembly met, and reſolved that ammunition and warlike ſtores ſhould be purchaſed with the public money.

New-Hampſhire followed the example of Rhode-Iſland, and ſeized a ſmall fort for the ſake of the powder and military ſtores it contained. In Pennſylvania, however, a convention was held, which expreſſed an earneſt deſire of reconciliation with the mother-country; though, at the ſame time, in the ſtrongeſt manner declaring, that they were reſolved to take up arms in defence of their juſt rights, and defend to the laſt their oppoſition to the late acts of parliament; and the people were exhorted to apply themſelves with the greateſt aſſiduity to the proſecution of ſuch manufactures as were neceſſary for their defence and ſubſiſtence, ſuch as ſalt, ſalt-petre, gunpowder, ſteel, &c. This was the univerſal voice of the colonies, New-York only excepted. The aſſembly of that province, as yet ignorant of the fate of their laſt remonſtrance, refuſed to concur with the other colonies in their determination to throw off the Britiſh yoke: their attachment, however, was very faint, and by the event it appeared that a perſeverence in the meaſures which the miniſtry had adopted was ſufficient to unite them to the reſt.

As the diſturbances had originated in the province of Maſſachuſetts-Bay, and *there* continued all along with the greateſt violence, ſo this was the province where the firſt hoſtilities were formerly commenced. 180

180 Maſſachuſetts aſſembly recommend preparations for war.

In the beginning of February the provincial congreſs met at Cambridge; and as from every appearance it became daily more evident, that arms muſt ultimately decide the conteſt, expertneſs in military diſcipline was recommended in the ſtrongeſt manner, and ſeveral military inſtitutions enacted; among which that of the *minute-men* was one of the moſt remarkable. Theſe were choſen from the moſt active and expert among the militia; and their buſineſs was to keep themſelves in conſtant readineſs at the call of their officers; from which perpetual vigilance they derived their title.—It was now eaſily ſeen that a ſlight occaſion would bring on hoſtilities, which could not but be attended with the moſt violent and certain deſtruction to the vanquiſhed party; for both were ſo much exaſperated by a long courſe of reproaches and literary warfare, that they ſeemed to be filled with the utmoſt inveteracy againſt each other.

On the 26th of February General Gage having been informed that a number of field-pieces had been brought to Salem, diſpatched a party to ſeize them. Their road was obſtructed by a river, over which was a draw-bridge. This the people had pulled up, and refuſed to let it down: upon which the ſoldiers ſeized a boat to ferry them over; but the people cut out her bottom. Hoſtilities would immediately have commenced, had it not been for the interpoſition of a clergyman, who repreſented to the military, on the one hand, the folly of oppoſing ſuch numbers; and to the people, on the other, that as the day was far ſpent the military could not execute their deſign, ſo that they might without any fear leave them the quiet poſſeſſion of the draw-bridge. This was complied with; and the ſoldiers, after having remained for ſome time at the bridge, returned without executing their orders.

181 Skirmiſh at Lexington.

The next attempt, however, was attended with more ſerious conſequences. General Gage having been informed that a large quantity of ammunition and military ſtores had been collected at Concord, about 20 miles from Boſton, and where the provincial congreſs was ſitting, ſent a detachment, under the command of Colonel Smith and Major Pitcairn, to deſtroy the ſtores, and, as was reported, to ſeize Meſſrs. Hancock and Adams, the leading men of the congreſs. They ſet out before day-break, on the 19th of April, marching with the utmoſt ſilence, and ſecuring every one they met on the road, that they might not be diſcovered. But notwithſtanding all their care, the continual ringing of bells and firing of guns as they went along, ſoon gave them notice that the country was alarmed.

About five in the morning they had reached Lexington 15 miles from Boston, where the militia of the place were exercising. Major Pitcairn called out to them, *disperse you rebels; throw down your arms and disperse:* but, as they still continued in a body, he advanced, discharged his pistol, and ordered his soldiers to fire; who instantly obeyed, and killed and wounded several of the militia: a dispersion of the militia was the consequence. The detachment then proceeded to Concord, where, having destroyed the stores, they fired upon the Americans; and a scuffle ensued, in which several fell on both sides. The purpose of their expedition being thus accomplished, it was necessary for the king's troops to retreat, which they did through a continual fire kept up on them from Concord to Lexington. Here their ammunition was totally expended; and they would have been unavoidably cut off, had not a considerable reinforcement commanded by Lord Percy met them. The Americans, however, continued their attack with great spirit; and the British would still have been in the utmost danger had it not been for two field-pieces which Lord Percy had brought with him. By these the impetuosity of the Americans was checked, and the British made good their retreat to Boston, with the loss of 273 killed wounded and made prisoners: that of the Americans was about 50 killed, 38 wounded and missing.

182
A great army assembles before Boston.

From the commencement of hostilities, the dispute between great Britain and the colonies took a new direction. By this engagement the spirits of the Americans were raised; a considerable army was assembled, who formed a line of encampment from Roxbury to Mystic, through a space of about 30 miles; and here they were soon after joined by a large body of Connecticut troops, under General Putnam, an old officer of great bravery and experience. By this formidable force was the town of Boston now kept blocked up. General Gage, however, had so strongly fortified it, that the army powerful as they were, durst not make an attack; while on the other hand, his force was by far too insignificant to meet such an army in the field. But towards the end of May, a considerable reinforcement having arrived, with Generals Howe, Burgoyne, and Clinton, he was soon enabled to attempt something of consequence. Some skirmishes in the mean time happened in the islands lying off Boston harbour, in which the Americans had the advantage, and burnt an armed schooner, which her people had been obliged to abandon after she was left aground by the tide. Nothing decisive, however, took place, till the 17th of June.

183
Battle at Bunker's Hill.

In the neighbourhood of Charlestown, a place on the northern shore of the peninsula on which Boston stands, is an high ground called *Bunker's Hill*, which overlooks and commands the whole town of Boston. In the night of the 16th the provincials took possession of this place: and worked with such indefatigable diligence, that, to the astonishment of their enemies, they had before day-light, almost completed a redoubt, with a strong entrenchment reaching half a mile eastward, as far as the river Mystic. After this they were obliged to sustain a heavy and incessant fire from the ships and floating batteries with which Charlestown neck was surrounded, as well as the cannon that could reach the place from Boston; in spite of which, however, they continued their work, and finished it before mid-day. A considerable body of foot was then landed at the foot of Bunker's Hill, under the command of Generals Howe and Pigot; the former being appointed to attack the lines, and the latter the redoubt. The Americans, however, having the advantage of the ground, as well as of their intrenchments, poured down such incessant volleys, as threatened the whole body with destruction; and General Howe was for a little time left almost alone, all his officers being killed or wounded. The provincials in the mean time had taken possession of Charlestown, so that General Pigot was obliged to contend with them in that place as well as in the redoubt. The consequence was, that he was overmatched; his troops were thrown into disorder; and he would in all probability have been defeated, had not General Clinton advanced to his relief: upon which the attack was renewed with such fury, that the provincials were driven beyond the neck that leads to Charlestown. In the heat of the engagement the British troops, in order to deprive the Americans of a cover, set fire to Charlestown, which was totally consumed; and, eventually, the Americans were obliged to retreat over Charlestown neck, and was raked by an incessant fire from the Glasgow man of war, and several floating batteries. The loss on the British side amounted to about 1000, among whom were 19 officers killed and 70 wounded; that of the Americans did not exceed 139 killed, and 314 wounded.

The British troops claimed the victory of this engagement; but it must be allowed that it was dearly bought; and the Americans boasted that the real advantages were on their side, as they had so much weakened the enemy that they durst not afterwards venture out of their entrenchments. Although this was the first time the provincials had been in actual service, they behaved themselves with the spirit of veterans, and by no means merited the appellation of *cowards*, with which they were so often branded in Britain. 184

The Americans become more and more determined in their opposition.

In other places the same determined spirit of resistance appeared on the part of the Americans. Lord North's conciliatory scheme was utterly rejected by the assemblies of Pennsylvania and New-Jersey, and afterwards in every other colony. The commencement of hostilities at Lexington determined the colony of New-York, which had hitherto continued to waver, to unite with the rest; and as the situation of New-York renders it unable to resist an attack from the sea, it was, resolved, before the arrival of a British fleet, to secure the military stores, send off the women and children, and set fire to the city if it was still found incapable of defence. The exportation of provisions was every where prohibited, particularly to the British fishery on the Banks of Newfoundland, or to such colonies of America as should adhere to the British interest. Congress resolved on the establishment of an army, and of a large paper currency in order to support it. 185

Crown-Point and Ticonderago taken by the Americans.

In the inland northern colonies, colonel Easton and Ethan Allen, without receiving any orders from congress, or communicating their designs to any body, with a party of only 250 men, surprised the forts of Crown-Point, Ticonderago, and the rest that form a communication betwixt the colonies and Canada. On this occasion 200 pieces of cannon fell into their hands, besides mortars, and a large quantity of military stores, together with two armed vessels, and materials for the construction of others.

America.

After the battle of Bunker's Hill, the provincials erected fortifications on the heights which commanded Charlestown, and strengthened the rest in such a manner that there was no hope of driving them from thence; at the same time that their activity and boldness astonished the British officers, who had been accustomed to entertain a mean and unjust opinion of their courage.

186 Troops in Boston distressed.

The troops, thus shut up in Boston, were soon reduced to distress. Their necessities obliged them to attempt the carrying off the American cattle on the islands before Boston, which produced frequent skirmishes; but the provincials, better acquainted with the navigation of these shores, landed on the islands, destroyed or carried off whatever was of any use, burned the light-house at the entrance of the harbour, and took prisoners the workmen sent to repair it, as well as a party of marines who guarded them. Thus the garrison were reduced to the necessity of sending out armed vessels to make prizes indiscriminately of all that came in their way, and of landing in different places to plunder for subsistence as well as they could.

187 Articles of union between the colonies.

The congress in the mean time continued to act with all the vigour which its constituents had expected. Articles of confederation and perpetual union were drawn up and solemnly agreed upon; by which they bound themselves and their posterity for ever. These were in substance as follows.

1. Each colony was to be independent within itself, and to retain an absolute sovereignty in all domestic affairs.

2. Delegates to be annually elected to meet in congress, at such time and place as should be enacted in the preceding congress.

3. This assembly should have the power of determining war or peace, making alliances; and in short all that power which sovereigns of states usually claim as their own.

4. The expences of war to be paid out of the common treasury, and raised by a poll-tax on males between 16 and 60; the proportions to be determined by the laws of the colony.

5. An executive council to be appointed to act in place of the congress during its recess.

6. No colony to make war with the Indians without consent of congress.

7. The boundaries of all the Indian lands to be secured and ascertained to them; and no purchases of lands were to be made by individuals, or even by a colony, without consent of congress.

8. Agents appointed by congress should reside among the Indians, to prevent frauds in trading with them, and to relieve, at the public expense, their wants and distresses.

9. This confederation to last until there should be a reconciliation with Britain; or, if that event should not take place, it was to be perpetual.

After the action of Bunker's Hill, however, when the power of Great Britain appeared less formidable in the eyes of America than before, congress proceeded formally to justify their proceedings in a declaration drawn up in terms more expressive, and well calculated to excite attention.

188 Declaration on taking up arms.

"Were it possible (said they) for men who exercise their reason, to believe that the divine Author of our existence intended a part of the human race to hold an absolute property in and unbounded power over others, marked out by His infinite goodness and wisdom as the objects of a legal domination, never rightfully resistible, however severe and oppressive; the inhabitants of these colonies might at least require from the parliament of Great-Britain some evidence that this dreadful authority over them had been granted to that body: but a reverence for our Great Creator, principles of humanity, and the dictates of common sense, must convince all those who reflect upon the subject, that government was instituted to promote the welfare of mankind, and ought to be administered for the attainment of that end.

"The legislature of Great-Britain, however, stimulated by an inordinate passion for power, not only unjustifiable, but which they know to be peculiarly reprobated by the very constitution of that kingdom; and despairing of success in any mode of contest where regard should be had to law, truth, or right; have, at length, deserting those, attempted to effect their cruel and impolitic purpose of enslaving these colonies by violence, and have thereby rendered it necessary for us to close with their last appeal from reason to arms. Yet, however blinded that assembly may be, by their intemperate rage for unlimited domination, so to slight justice in the opinion of mankind, we esteem ourselves bound by obligations to the rest of the world to make known the justice of our cause."

After taking notice of the manner in which their ancestors left Britain, the happiness attending the mutual friendly commerce betwixt that country and her colonies, and the remarkable success of the late war, they proceed as follows: "The new ministry, finding the brave foes of Britain, though frequently defeated, yet still contending, took up the unfortunate idea of granting them a hasty peace, and of then subduing her faithful friends.

"These devoted colonies were judged to be in such a state as to present victories without bloodshed, and all the easy emoluments of statutable plunder. The uninterrupted tenor of their peaceable and respectful behaviour from the beginning of their colonization; their dutiful, zealous, and useful services during the war, though so recently and amply acknowledged in the most honourable manner by his majesty, by the late king, and by parliament, could not save them from the intended innovations. Parliament was influenced to adopt the pernicious project; and assuming a new power over them, has in the course of eleven years given such decisive specimens of the spirit and consequences attending this power, as to leave no doubt of the effects of acquiescence under it.

"They have undertaken to give and grant our money without our consent, though we have ever exercised an exclusive right to dispose of our own property. Statutes have been passed for extending the jurisdiction of the courts of admiralty and vice-admiralty beyond their ancient limits; for depriving us of the accustomed and inestimable rights of trial by jury, in cases affecting both life and property; for suspending the legislature of one of our colonies; for interdicting all commerce to the capital of another; and for altering fundamentally the form of government established by charter, and secured by acts of its own legislature;

and

America. and solemnly confirmed by the crown; for exempting the murderers of colonists from legal trial, and in effect from punishment; for erecting in a neighbouring province, acquired by the joint arms of Great-Britain and America, a despotism dangerous to our very existence; and for quartering soldiers upon the colonists in time of a profound peace. It has also been resolved in parliament, that colonists, charged with committing certain offences, shall be transported to England to be tried.

"But why should we enumerate our injuries in detail?—By one statute it was declared, that parliament can of right make laws to bind us in all cases whatever. What is to defend us against so enormous, so unlimited a power? Not a single person who assumes it is chosen by us, or is subject to our controul or influence; but, on the contrary, they are all of them exempt from the operation of such laws; and an American revenue, if not diverted from the ostensible purposes for which it is raised, would actually lighten their own burdens in proportion as it increases ours.

"We saw the misery to which such despotism would reduce us. We for ten years incessantly and ineffectually besieged the throne as supplicants; we reasoned, we remonstrated with parliament in the most mild and decent language; but administration, sensible that we should regard these measures as freemen ought to do, sent over fleets and armies to enforce them.

"We have pursued every temperate, every respectful measure; we have even proceeded to break off all commercial intercourse with our fellow-subjects, as our last peaceable admonition, that our attachment to no nation on earth would supplant our attachment to liberty; this we flattered ourselves was the ultimate step of the controversy; but subsequent events have shown how vain was this hope of finding moderation in our enemies!

"The Lords and Commons, in their address in the month of February, said, that a rebellion at that time actually existed in the province of Massachusetts-Bay; and that those concerned in it had been countenanced and encouraged by unlawful combinations and engagements entered into by his majesty's subjects in several of the colonies; and therefore they besought his majesty that he would take the most effectual measures to enforce due obedience to the laws and authority of the supreme legislature. Soon after the commercial intercourse of whole colonies with foreign countries was cut off by an act of parliament; by another, several of them were entirely prohibited from the fisheries in the seas near their coasts, on which they always depended for their subsistence; and large reinforcements of ships and troops were immediately sent over to General Gage.

"Fruitless were all the intreaties, arguments, and eloquence of an illustrious band of the most distinguished peers and commoners, who nobly and strenuously asserted the justice of our cause, to stay, or even to migate, the heedless fury with which these accumulated outrages were hurried on. Equally fruitless was the interference of the city of London, of Bristol, and of many other respectable towns in our favour."

After having reproached parliament, General Gage, and the British government in general, they proceed thus: "We are reduced to the alternative of choosing an unconditional submission to tyranny, or resistance by force. The latter is our choice. We have counted the cost of this contest, and find nothing so dreadful as voluntary slavery. Honour, justice, and humanity, forbid us tamely to surrender that freedom which we received from our gallant ancestors, and which our innocent posterity have a right to receive from us. Our cause is just; our union is perfect, our internal resources are great; and, if necessary, foreign assistance is undoubtedly attainable. We fight not for glory or conquest; we exhibit to mankind the remarkable spectacle of a people attacked by unprovoked enemies. They boast of their privileges and civilization, and yet proffer no milder conditions than servitude or death. In our native land, in defence of the freedom that is our birthright, for the protection of our property acquired by the honest industry of our forefathers and our own, against violence actually offered, we have taken up arms; we shall lay them down when hostilities shall cease on the part of our aggressors, and all danger of their being renewed shall be removed—and not before."

These are some of the most striking passages in the declaration of congress on taking up arms against Great-Britain, and dated July 6th, 1775. The determined spirit which it shows, ought to have convinced the people of Britain, that the conquest of America was an event scarce ever to be expected. In every other respect an equal spirit was shown; and 189
the rulers of the British nation had the mortification to see those whom they styled *rebels* and *traitors*, succeed in negociations in which they themselves were utterly foiled. In the passing of the Quebec-bill, ministry had flattered themselves that the Canadians would be so much attached to them on account of restoring the French laws, that they would very readily join in any attempt against the colonists who had reprobated that bill in such strong terms: but in this, as in every thing else indeed, they found themselves mistaken. The Canadians having been subject to Britain for a period of 15 years, and being thus rendered sensible of the advantage of British government, received the bill itself with evident marks of disapprobation; nay. reprobated it as tyrannical and oppressive. A scheme had been formed for General Carleton, governor of the province, to raise an army of Canadians wherewith to act against the Americans; and so sanguine were the hopes of administration in this respect, that they had sent 20,000 stand of arms, and a great quantity of military stores, to Quebec for the purpose. But the people, though they did not join the Americans, yet were found immoveable in their purpose to stand neuter. Application was made to the bishop; but he declined to interpose his influence, as contrary to the rules of the Popish clergy: so that the utmost efforts of government in this province were found to answer little or no purpose.

Quebec bill disagreeable to those whom it was intended to please.

190
The British administration next tried to engage the Indians in their cause. But though agents were dispersed among them with large presents to the chiefs, they universally replied, that they did not understand the nature of the quarrel, nor could they distinguish whether those who dwelt in America or on the other side of the ocean were in fault: but they were surprised

Ministry attempt in vain to arm the Indians.

prised to see Englishmen ask their assistance against one another; and advised them to be reconciled, and not to think of shedding the blood of their brethren.—To the representations of congress they paid more respect. These set forth, that the English on the other side of the ocean, had taken up arms to enslave, not only their countrymen in America, but the Indians also; and if the latter should enable them to overcome the colonists, they themselves would soon be reduced to a state of slavery also. By arguments of this kind these savages were engaged to remain neuter; and thus the colonists were freed from a most dangerous enemy. On this occasion the congress thought proper to hold a solemn conference with the different tribes of Indians. The speech made by them on the occasion is curious, but too long to be fully inserted. The following is a specimen of the European mode of addressing these people.

191 Speech of the commissioners from congress to the Indians.

"Brothers, Sachems, and Warriors!

"We the delegates from the Twelve United Provinces, now sitting in general congress at Philadelphia, send their talk to you our brothers.

"Brothers and Friends, now attend!

"When our fathers crossed the great water, and came over to this land, the king of England gave them a talk, assuring them that they and their children should be his children; and that if they would leave their native country, and make settlements, and live here, and buy and sell, and trade with their brethren beyond the water, they should still keep hold of the same covenant-chain, and enjoy peace; and it was covenanted, that the fields, houses, goods, and possessions, which our fathers should acquire, should remain to them as their own, and be their childrens for ever, and at their sole disposal.

"Brothers and Friends, open an ear!

"We will now tell you of the quarrel betwixt the counsellors of King George and the inhabitants and colonies of America.

"Many of his counsellors have persuaded him to break the covenant-chain, and not to send us any more good talks. They have prevailed upon him to enter into a covenant against us, and have torn asunder, and cast behind their backs, the good old covenant which their ancestors and ours entered into, and took strong hold of. They now tell us they will put their hands into our pocket without asking, as though it were their own; and at their pleasure they will take from us our charters, or written civil constitution, which we love as our lives; also our plantations, our houses, and our goods, whenever they please, without asking our leave. They tell us that our vessels may go to that or this island in the sea, but to this or that particular island we shall not trade any more; and in case of our noncompliance with these new orders, they shut up our harbours.

"Brothers, we live on the same ground with you; the same island is our common birth-place. We desire to sit down under the same tree of peace with you: let us water its roots, and cherish the growth, till the large leaves and flourishing branches shall extend to the setting sun, and reach the skies. If any thing disagreeable should ever fall out between us, the Twelve United Colonies, and you, the Six Nations, to wound our peace, let us immediately seek measures for healing the breach. From the present situation of our affairs, we judge it expedient to kindle up a small fire at Albany, where we may hear each other's voice, and disclose our minds fully to one another."

192 General Washington appointed commander in chief.

The other remarkable transactions of this congress were the ultimate refusal of the conciliatory proposal made by Lord North, of which such sanguine expectations had been formed by the English ministry; and appointing a generalissimo to command their armies, which were now very numerous. The person chosen for this purpose was George Washington: a man so universally beloved, that he was raised to such a high station by the unanimous voice of congress; and his subsequent conduct showed him every way worthy of it. Horatio Gates and Charles Lee, two English officers of considerable reputation, were chosen; the former an adjutant-general, the second a major-general. Artemus Ward, Philip Schuyler, and Israel Putnam, were likewise nominated major-generals. Seth Pomeroy, Richard Montgomery, David Wooster, William Heath, Joseph Spencer, John Thomas, John Sullivan, and Nathanael Green, were chosen brigadier generals at the same time.

193 Georgia accedes to the confederacy.

Congress had now also the satisfaction to receive deputies from the colony of Georgia, expressing a desire to join the confederacy. The reasons they give for renouncing their allegiance to Britain was, that the conduct of parliament towards the other colonies had been oppressive; that though the obnoxious acts had not been extended to them, they could view this only as an omission, because of the seeming little consequence of their colony; and therefore looked upon it rather to be a slight than a favour. At the same time they framed a petition to the king, similar to that sent by the other colonies, and which met with a similar reception.

The success which had hitherto attended the Americans in all their measures, now emboldened them to think not only of defending themselves, but likewise of acting offensively against Great-Britain. The conquest of Canada appeared an object within their reach, and one that would be attended with many advantages; and as an invasion of that province was already facilitated by the taking of Crown-Point and Ticonderoga, it was resolved if possible to penetrate that way into Canada, and reduce Quebec during the winter, before the fleets and armies which they were well assured would sail thither from Britain should arrive. By order of congress, therefore, 3000 men were put under the command of Generals Montgomery and Schuyler, with orders to proceed to Lake Champlain, from whence they were to be conveyed in flat-bottomed boats to the mouth of the river Sorel, a branch of the great river St. Lawrence, and on which is situated a fort of the same name with the river. On the other hand, they were opposed by General Carleton, governor of Canada, a man of great activity and experience in war; who, with a very few troops, had hitherto been able to keep in awe the disaffected people of Canada, notwithstanding all the representations of the colonists. He had now augmented his army by a considerable number of Indians, and promised, even in his present situation, to make a very formidable resistance.

194 The Americans attempt the conquest of Canada.

As soon as General Montgomery arrived at Crown-Point, he received information that several armed vessels were stationed at St. John's, a strong fort on the

 Sorel,

America. Sorel, with a view to prevent his crossing the lake; on which he took possession of an island which commands the mouth of the Sorel, and by which he could prevent them from entering the lake. In conjunction with General Schuyler, he next proceeded to St John's: but finding that place too strong, it was agreed in a council of war, to retire to Isle aux Noix, where General Schuyler being taken ill, Montgomery was left to command alone. His first step was to gain over the Indians whom Gen. Carleton had employed, and this he in a great measure accomplished; after which, on receiving the full number of troops appointed for his expedition, he determined to lay siege to St John's.

195 Chamblee taken.

In this he was facilitated by the reduction of Chamblee, a small fort in the neighbourhood, where he found a large supply of powder. An attempt was made by General Carleton to relieve the place; for which purpose he with great pains collected about 1000 Canadians, while Colonel Maclean proposed to raise a regiment of the Highlanders who had emigrated from their own country to America.

196 Gen. Carleton defeated.

But while Gen. Carleton was on his march with these new levies, he was attacked by the provincials, and utterly defeated; which being made known to another body of Canadians who had joined Colonel Maclean, they abandoned him without striking a blow, and he was obliged to retreat to Quebec.

The defeat of General Carleton was a sufficient recompence to the Americans for that of Colonel Ethan Allen, which had happened some time before. The success which had attended this gentleman against Crown-Point and Ticonderago had emboldened him to make a similar attempt on Montreal; but being attacked by the militia of the place, supported by a detachment of regulars, he was entirely defeated and taken prisoner.

As the defeat of General Carleton and the desertion of Maclean's forces left no room for the garrison of St John's to hope for any relief, they now consented to surrender themselves prisoners of war; but were in

197 St John's fort taken,

other respects treated with great humanity. They were in number 500 regulars and 200 Canadians, among whom were many of the French nobility, who had been very active in promoting the cause of Britain among their countrymen.

General Montgomery next took measures to prevent the British shipping from passing down the river from Montreal to Quebec. This he accomplished so effectually, that the whole were taken. The town itself was obliged to surrender at discretion; and it was with the utmost difficulty that General Carleton escaped in an open boat by the favour of a dark night.

198 And likewise Montreal.

No further obstacle now remained in the way of the Americans to the capital, except what arose from the nature of the country; and these indeed were very considerable. Nothing, however, could damp the ardour of the provincials. Notwithstanding it was now the middle of November, and the depth of winter was at hand, Colonel Arnold formed a design of penetrating through woods, morasses, and the most frightful solitudes from New-England to Canada by a nearer way than that which Montgomery had chosen; and this he accomplished in spite of every difficulty, to the astonishment of all who saw or heard of the attempt.

199 Col. Arnold penetrates into Canada.

A third part of his men under another colonel had been obliged to leave him by the way, for want of provisions; the total want of artillery rendered his presence insignificant before a place strongly fortified; and the smallness of his army rendered it even doubtful whether he could have taken the town by surprise. The Canadians indeed were amazed at the exploit, and their inclination to revolt from Britain was somewhat augmented; but none of them as yet took up arms in behalf of America. The consternation into which the town of Quebec was thrown proved detrimental rather than otherwise to the expedition; as it doubled the vigilance and activity of the inhabitants to prevent any surprise; and the appearance of common danger united all parties, who, before the arrival of Arnold, were contending most violently with one another. He was therefore obliged to content himself with blocking up the avenues to the town, in order to distress the garrison for want of provisions; and even this he was unable to do effectually, by reason of the small number of his men. America.

The matter was not much mended by the arrival of General Montgomery. The force he had with him, even when united to that of Arnold, was too insignificant to attempt the reduction of a place so strongly fortified, especially with the assistance only of a few mortars and field-pieces. After the siege had continued through the month of December, General Montgomery, conscious that he could accomplish his end no other way than by surprise, resolved to make an attempt on the last day of the year 1775. 200 Attempt to surprise Quebec.

The method he took at this time was perhaps the best that human wisdom could devise. He advanced by break of day, in the midst of an heavy fall of snow, which covered his men from the sight of the enemy. Two real attacks were made by himself and Colonel Arnold, at the same time that two feigned attacks were made on two other places, thus to distract the garrison, and make them divide their forces. One of the real attacks was made by the people of New-York, and the other by those of New-England under Arnold. Their hopes of surprising the place, however, were defeated by the signal for the attack being through some mistake given too soon. General Montgomery himself had the most dangerous place, being obliged to pass between the river and some high rocks on which the Upper Town stands; so that he was forced to make what haste he could to close with the enemy. His fate, however, was now decided. Having forced the first barrier, a violent discharge of musketry and grape-shot from the second killed him, his principal officers, and the most of the party he commanded; on which those who remained immediately retreated. 201 General Montgomery killed, and the Americans defeated.

Colonel Arnold, in the mean time, made a desperate attack on the Lower Town, and carried one of the barriers after an obstinate resistance for an hour; but in the action he himself received a wound, which obliged him to withdraw. The attack, however, was continued by the officers whom he had left, and another barrier forced; but the garrison, now perceiving that nothing was to be feared except from that quarter, collected their whole force against it; and, after a desperate engagement of three hours, overpowered the provincials, and obliged them to surrender.

In this action, it must be confessed that the valour of the provincial troops could not be exceeded. They had

America.

had fought under as great disadvantages as those which attended the British at Bunker's Hill, and had behaved equally well. Such a terrible disaster left no hope remaining of the accomplishment of their purpose, as General Arnold could now scarce number 800 effective men under his command. He did not, however, abandon the province, or even remove to a greater distance than three miles from Quebec; and here he still found means to annoy the garrison very considerably by intercepting their provisions. The Canadians notwithstanding the bad success of the American arms, still continued friendly; and thus he was enabled to

202 Arnold created a Brigadier-General.

sustain the hardships of a winter-encampment in that most severe climate. The congress, far from passing any censure on him for his misfortune, created him a brigadier-general.

203 Disputes of Lord Dunmore with his province of Virginia.

While hostilities were thus carried on with vigour in the north, the flame of contention was gradually extending itself in the south. Lord Dunmore, the governor of Virginia, was involved in disputes similar to those which had taken place in other colonies. These had proceeded so far that the assembly was dissolved; which in this province was attended with a consequence unknown to the rest. As Virginia contained a great number of slaves, it was necessary that a militia should be kept constantly on foot to keep them in awe. During the dissolution of the assembly the militia-laws expired; and the people, after complaining of the danger they were in from the negroes, formed a convention, which enacted that each county should raise a quota for the defence of the province. Dunmore, on this, removed the powder from Williamsburg; which created such discontents, that an immediate quarrel would probably have ensued, had not the merchants of the town undertaken to obtain satisfaction for the injury supposed to be done to the community. This tranquillity, however, was soon interrupted; the people, alarmed by a report that an armed party were on their way from the man of war where the powder had been deposited, assembled in arms, and determined to oppose by force any farther removals. In some of the conferences which passed at this time, the governor let fall some unguarded expressions, such as threatening them with setting up the royal standard, proclaiming liberty to the negroes, destroying the town of Williamsburg, &c. which were afterwards made public, and contributed greatly to increase the public ferment.

The people now held frequent assemblies. Some of them took up arms with a design to force the governor to restore the powder, and to take the public money into their own possession: but on their way to Williamsburg for this purpose, they were met by the receiver-general, who became security for the payment of the gun-powder, and the inhabitants promised to take care of the magazine and public revenue.

204 He sends his family aboard a man of war.

By these proceedings the governor was so much intimidated, that he sent his family on board a man of war. He himself, however, issued a proclamation, in which he declared the behaviour of the person who promoted the tumult treasonable, accused the people of dissatisfaction, &c. On their part they were by no means deficient in recriminating; and some letters of his to Britain being about the same time discovered, consequences ensued extremely similar to those which had been occasioned by those of Mr Hutchinsons at Boston.

In this state of confusion the governor thought it necessary to fortify his palace with artillery, and procure a party of marines to guard it. Lord North's conciliatory proposal arriving also about the same time, he used his utmost endeavours to cause the people comply with it. The arguments he used were plausible; and, had not matters already gone to such a pitch of distraction, it is highly probable that some attention would have been paid to them. "The view (he said) in which the colonies ought to behold this conciliatory proposal, was no more than an earnest admonition from Great-Britain to relieve her wants: that the utmost condescendence had been used in the mode of application; no determinate sum having been fixed, as it was thought most worthy of British generosity to take what they thought could be conveniently spared, and likewise to leave the mode of raising it to themselves," &c. But the clamour and dissatisfaction were now so universal, that nothing else could be attended to. The governor had called an assembly for the purpose of laying this conciliatory proposal before them; but it had been little attended to. The assembly began their session by inquiries into the state of the magazine. It had been broken into by some of the townsmen; for which reason spring-guns had been placed there by the governor, which discharged themselves upon the offenders at their entrance: these circumstances with others of a similar kind, raised such a violent uproar, that, as soon as the preliminary business of the session was over, the governor retired on board a man of war, informing the assembly that he durst no longer trust himself on shore. This produced a long course of disputation, which ended in a positive refusal of the governor to trust himself again in Williamsburg, even to give his assent to the bills, which could not be passed without it, and though the assembly offered to bind themselves for his personal safety. In his turn he requested them to meet him on board the man of war, where he then was; but his proposal was rejected, and all further correspondence containing the least appearance of friendship was discontinued.

205 Fortifies his palace.

206 His arguments for L. North's conciliatory plan.

207 The governor retires on board a man of war.

208 Attempts to reduce the colony by force;

Lord Dunmore, having thus abandoned his government, attempted to reduce by force those whom he could no longer govern. Some of the most strenuous adherents to the British cause, whom their zeal had rendered obnoxious at home, now repaired to him. He was also joined by numbers of black slaves. With these, and the assistance of the British shipping, he was for some time enabled to carry on a kind of predatory war sufficient to hurt and exasperate, but not to subdue. After some inconsiderable attempts on land, proclaiming liberty to the slaves, and setting up the royal standard, he took up his residence at Norfolk, a maritime town of some consequence, where the people were better affected to Britain than in most other places. A considerable force, however, was collected against him; and the natural impetuosity of his temper prompting him to act against them with more courage than caution, he was entirely defeated, and obliged to retire to his shipping, which was now crowded by the number of those who had incurred the resentment of the provincials.

209 But is entirely defeated.

210 Mr Conolly's plan for reducing Virginia.

In the mean time a scheme of the utmost magnitude and importance was formed by one Mr Conolly, a Pennsylvanian, attached to the cause of Britain. The first step

ſtep of this plan was to enter into a league with the Ohio Indians. This he communicated to Lord Dunmore, and it received his approbation: Upon which Conolly ſet out, and actually ſucceeded in his deſign. On his return he was diſpatched to General Gage, from whom he received a colonel's commiſſion, and ſet out in order to accompliſh the remainder of his ſcheme. The plan in general was, that he ſhould return to the Ohio, where, by the aſſiſtance of the Britiſh and Indians in theſe parts, he was to penetrate through the back ſettlements into Virginia, and join

211 Lord Dunmore at Alexandria. But by an accident very naturally to be expected, he was diſcovered, taken priſoner, and confined.

He is diſcovered and taken priſoner.

After the retreat of Lord Dunmore from Norfolk, that place was taken poſſeſſion of by the provincials, who greatly diſtreſſed thoſe on board Lord Dunmore's fleet, by refuſing to ſupply them with any neceſſaries. This proceeding drew a remonſtrance from his Lordſhip; in which he inſiſted that the fleet ſhould be furniſhed with neceſſaries; but his requeſt being denied, a reſolution was taken to ſet fire to the town. After

212 giving the inhabitants proper warning, a party landed, under cover of a man of war, and ſet fire to that part which lay neareſt the ſhore; but the flames were obſerved at the ſame time to break forth in every other quarter, and the whole town was reduced to aſhes. This univerſal deſtruction, occaſioned a loſs of more than L. 300,000.

The town of Norfolk deſtroyed.

213 In the ſouthern colonies of Carolina, the governors were expelled, and obliged to take refuge on board of men of war, as Lord Dunmore had been; Mr Martin, governor of North Carolina, on a charge of attempting to raiſe the back-ſettlers, conſiſting chiefly of Scots Highlanders, againſt the colony. Having ſecured themſelves againſt any attempts from theſe enemies, however, they proceeded to regulate their internal concerns in the ſame manner as the reſt of the colonies; and by the end of the year 1775, Britain beheld the whole of America united againſt her in the moſt determined oppoſition. Her vaſt poſſeſſions of that tract of land (ſince known by the name of the *Thirteen United States*) were now reduced to the ſingle town of Boſton; in which her forces were beſieged by an army with whom they were apparently not able to cope, and by whom they muſt of courſe expect in a very ſhort time to be expelled. The ſituation of the in-

The governors of South and North Carolina expelled.

214 habitants of Boſton, indeed, was peculiarly unhappy. After having failed in their attempts to leave the town, General Gage had conſented to allow them to retire with their effects; but afterwards, treacherouſly refuſed to fulfil his promiſe. When he reſigned his place to General Howe in October 1775, the latter, apprehenſive that they might give intelligence of the ſituation of the Britiſh troops, ſtrictly prohibited any perſon from leaving the place under pain of military execution. Thus matters continued till the month of March 1776, when the town was evacuated.

Miſerable ſituation of Boſton.

215 On the 2d of that month, General Waſhington opened a battery on the weſt ſide of the town, from whence it was bombarded, with a heavy fire of cannon at the ſame time; and three days after, it was attacked by another battery from the eaſtern ſhore. This terrible attack continued for 14 days without intermiſſion; when General Howe, finding the place no longer tenable, determined if poſſible to drive the enemy from their works. Preparations were therefore made for a moſt vigorous attack, on an hill called Dorcheſter Neck, which the Americans had fortified in ſuch a manner as would in all probability have rendered the enterpriſe next to deſperate. No difficulties, however, were ſufficient to daunt the ſpirit of the general; and every thing was in readineſs, when a ſudden ſtorm prevented an exertion which muſt have been productive of a dreadful waſte of blood. Next day, upon a more cloſe inſpection of the works they were to attack, it was thought adviſable to deſiſt from the enterpriſe altogether. The fortifications were very ſtrong, and extremely well provided with artillery; and, beſides other implements of deſtruction, upwards of 100 hogſheads of ſtones were provided to roll down upon the enemy as they came up; which, as the aſcent was extremely ſteep, muſt have done prodigious execution.

Boſton ſeverely cannonaded by the provincials.

Nothing therefore now remained but to think of a retreat; and even this was attended with the utmoſt difficulty and danger. The Americans, however, knowing that it was in the power of the Britiſh general to reduce the town to aſhes, which could not have been repaired in many years, did not think proper to give the leaſt moleſtation; and for the ſpace of a fortnight the troops were employed in the evacuation of the place, from whence they carried along with them 2000 of the inhabitants, who durſt not ſtay on account of their attachment to the Britiſh cauſe. From Boſton they ſailed to Halifax; but all their vigilance could not prevent a number of valuable ſhips from falling into the hands of the Americans. A conſiderable quantity of cannon and ammunition had alſo been left at Bunker's Hill and Boſton Neck; and in the town, an immenſe variety of goods, principally woollen and linen, of which the provincials ſtood very much in need. The eſtates of thoſe who fled to Halifax were confiſcated; as alſo thoſe who were attached to government, and had remained in the town. As an attack was expected as ſoon as the Britiſh forces ſhould arrive, every method was employed to render the fortifications already very ſtrong, impregnable. For this purpoſe ſome foreign engineers were employed, who had before arrived at Boſton; and ſo eager were people of all ranks to accompliſh this buſineſs, that every able-bodied man in the place, without diſtinction of rank, ſet apart two days in the week, to complete it the ſooner. 216

The place evacuated.

217 Its fortifications ſtrengthened.

The Americans exaſperated to the utmoſt by the proceedings of parliament, which placed them out of the royal protection, and engaged foreign mercenaries in the plan for ſubduing them, now formally renounced all connection with Britain, and declared themſelves independent. This celebrated declaration was publiſhed on the 4th of July 1776. Previous to this a circular letter had been ſent through each colony, ſtating the reaſons for it; and ſuch was the animoſity now every where prevailing againſt Great-Britain, that it met with univerſal approbation, except in the province of Maryland alone. It was not long, however, before the people of that colony, finding themſelves left in a very dangerous minority, thought proper to accede to the meaſures of the reſt. The manifeſto itſelf was in the uſual nervous ſtyle, ſtating a long liſt of grievances, for which redreſs had been often applied 218

Congreſs declare the States of America independent.

in

America. in vain; and for these reasons they determined on a final separation; to hold the people of Britain as the rest of mankind, "enemies in war, in peace friends."

After thus publicly throwing off all allegiance and hope of reconciliation, the colonists soon found that an exertion of all their strength was required in order to support their pretensions. Their arms, indeed, had not, during this season, being attended with success in Canada. Reinforcements had been promised to Colonel Arnold, who still continued the blockade of Quebec;

219 The siege of Quebec still continued.

but they did not arrive in time to second his operations. Being sensible, however, that he must either desist from the enterprise, or finish it successfully, he recommenced in form; attempting to burn the shipping, and even to storm the town itself. They were unsuccessful, however, by reason of the smallness of their number, though they succeeded so far as to burn a number of houses in the suburbs; and the garrison were obliged to pull down the remainder, in order to prevent the fire from spreading.

As the provincials, though unable to reduce the town, kept the garrison in continual alarms, and in a very disagreeable situation, some of the nobility collected themselves into a body under the command of

220 Canadians defeated by the provincials;

one Mr. Beaujeu, in order to relieve their capital; but they were met on their march by the provincials, and so entirely defeated, that they were never afterwards able to attempt any thing. Their want of artillery at last convinced them, that it was impracticable in their situation to reduce a place so strongly fortified; the small-pox, at the same time made its appearance in their camp, and carried off great numbers; intimidating the rest to such a degree, that they deserted in crowds. To add to their misfortunes, the British reinforcements unexpectedly appeared, and the ships made their way through the ice with such celerity,

221 Who are in their turn defeated by General Carleton.

that the one part of their army was separated from the other; and General Carleton sallying out as soon as the reinforcement was landed, obliged them to fly with the utmost precipitation, leaving behind them all their cannon and military stores; at the same time that their shipping was entirely captured by vessels sent up the river for that purpose. On this occasion the provincials fled with such preciptation that they could not be overtaken; so that none fell into the hands of the British, excepting the sick and wounded.

222 Humanity of the British general.

General Carleton now gave a signal instance of his humanity: Being well apprised that many of the provincials had not been able to accompany the rest in their retreat, and that they were concealed in woods, &c. in a very deplorable situation, he generously issued a proclamation, ordering proper persons to seek them out, and give them relief at the public expence; at the same time lest, through fear of being made prisoners, they should refuse these offers of humanity, he promised that, as soon as their situation enabled them, they should be at liberty to depart to their respective homes.

223 He pursues the provincials.

The British general, now freed from any danger of an attack, was soon enabled to act offensively against the provincials, by the arrival of the forces destined for that purpose from Britain. By these he was put at the head of 12,000 regualar troops, among whom were those of Brunswick. With this force he instantly set out to the Three Rivers, where he expected that Arnold would have made a stand; but he had retired to Sorel, a place 150 miles distant from Quebec, where he was at last met by the reinforcement ordered by congress. Here, though the preceding events were by no means calculated to inspire much military ardour, a very daring enterprize was undertaken; and this was, to surprise the British troops posted here under Generals Fraser and Nesbit; of whom the former commanded those on land, the latter, such as were on board of transports and were but a little way distant. The enterprise was undoubtedly very hazardous, both on account of the strength of the parties against whom they were to act, and as the main body of the British forces were advanced within 50 miles of the place; besides that a number of armed vessels and transports with troops lay between them and the Three Rivers.

224 General Thomson defeated and taken prisoner by General Fraser.

Two thousand chosen men, however, under General Thomson, engaged in this enterprise. Their success was by no means answerable to their spirit and valour. Though they passed the shipping without being observed, General Fraser had notice of their landing; and thus being prepared to receive them, they were soon thrown into disorder, at the same time that General Nesbit, having landed his forces, prepared to attack them in the rear. On this occasion some field-pieces did prodigious execution, and a retreat was found to be unavoidable, General Nesbit, however, had got between them and their boats, so that they were obliged to take a circuit through a deep swamp, while they were hotly pursued by both parties at the same time, who marched for some miles on each side the swamp, till at last the unfortunate provincials were sheltered from further danger by a wood at the end of the swamp. Their general, however, was taken with 200 of his men.

By this disaster the provincials lost all hopes of accomplishing any thing more in Canada. They demolished their works, and carried off their artillery with the utmost expedition.

225 The provincials pursued by Gen. Burgoyne.

They were pursued, however, by General Burgoyne; who on the 18th of June arrived at Fort St John's, which he found abandoned and burnt. Chamblee had shared the same fate, as well as all the vessels that were not capable of being dragged up against the current of the river; and the provincial troops had retreated across the lake to Crown-Point, whither they could not be immediately followed.

226 But escape to Crown-Point.

Thus was the province of Canada entirely evacuated by the Americans, who had thus secured the frontiers of the adjacent states from invasion on the part of the British; the object of a campaign in which 13000 men were employed, and near a million of money expended, was rendered in a great measure abortive. General Sullivan, who conducted this retreat after the affair of General Thompson, had great merit in what he did, and received the thanks of congress accordingly.

This was followed by some transactions in the southern colonies, which farther evinced their resolution, and raised the spirits of the Americans—We have formerly taken notice that Mr Martin, governor of North-Carolina, had been obliged to leave his province and take refuge on board a man of war. Notwithstanding this he did not despair of reducing it again to obedience. For this purpose he applied to the regulators, a daring set of banditti, who lived in a kind

America.

227 An insurrection in North-Carolina in favour of Britain.

kind of independent state; and though considered by government as rebels, yet had never been molested, on account of their numbers and known skill in the use of fire-arms. To the chiefs of these people commissions were sent, in order to raise some regiments; and a Colonel Macdonald was appointed to command them. In the month of February he erected the king's standard, issued proclamations, &c. and collected some forces, expecting to be soon joined by a body of regular troops, who were known to be shipped from Britain to act against the southern colonies. The Americans, sensible of their danger, dispatched immediately what forces they had to act against the royalists, at the same time that they diligently exerted themselves to support these with suitable reinforcements. Their present force was commanded by General Moore, whose numbers were inferior to Macdonald; for which reason the latter summoned him to join the king's standard under pain of being treated as a rebel. But Moore, being well provided with cannon, and conscious that nothing could be attempted against him, returned the compliment, by acquainting Colonel Macdonald, that if he and his party would lay down their arms, and subscribe an oath of fidelity to congress, they should be treated as friends; but if they persisted in an undertaking for which it was evident they had not sufficient strength, they could not but expect the severest treatment. In a few days General Moore found himself at the head of 8000 men, by reason of the continual supplies which daily arrived from all parts. The royal party amounted only to 2000, and they were destitute of artillery, which prevented them from attacking the enemy while they had the advantage of numbers. They were now therefore obliged to have recourse to a desperate exertion of personal valour; by dint of which they effected a retreat for near 80 miles to Moore's Creek, within 16 miles of Wilmington. Could they have gained this place, they expected to have been joined by governor Martin and general Clinton, who had lately arrived with a considerable detachment. But general Moore with his army pursued them so close, that they were obliged to attempt the passage of the creek itself, tho' a considerable body of the Americans, under the command of Colonel Caswell, with fortifications well planted with cannon, was posted on the other. On attempting the creek, however, it was found not to be fordable. They were obliged therefore to cross over a wooden bridge, which the provincials had not time to destroy entirely. They had, however, by pulling up part of the planks, and greasing the remainder in order to render them slippery, made the passage so difficult, that the royalists could not attempt it. In this situation they were, on the 27th of February, attacked by general Moore with his superior army, and totally defeated with the loss of their general and most of their leaders, as well as the best and bravest of their men.

228 The royalists entirely defeated.

Thus was the power of the Americans established in North-Carolina. Nor were they less successful in the province of Virginia; where Lord Dunmore having long continued an useless predatory war, was at last driven from every creek and road in the province. The people he had on board were distressed to the highest degree by confinement in small vessels. The heat of the season, and the numbers crowded together, produced a pestilential fever, which made great hovock, especially among the blacks. At last, finding themselves in the utmost hazard of perishing by famine as well as disease, they set fire to the least valuable of their vessels, reserving only about 50 for themselves, in which they bid a final adieu to Virginia, some sailing to Florida, some to Bermuda, and the rest to the West-Indies.

229 Lord Dunmore finally driven out of Virginia.

In South-Carolina the Americans had a more formidable enemy to deal with. At Cape-Fear a junction was formed between Sir Henry Clinton, and Sir Peter Parker, the latter of whom had sailed with his squadron directly from Europe. They concluded to attempt the reduction of Charleston as being, of all places within the line of their instructions, the object at which they could strike with the greatest prospect of advantage. They had 2,800 land forces, which they hoped, with the co-operation of their shipping, would be fully sufficient.

230 British armament sent against Charleston. *Ramsay's History, Vol. I. p. 288, 289.*

For some months past every exertion had been made to put the colony of South-Carolina, and especially its capital Charleston, in a respectable posture of defence. In subserviency to this view, works had been erected on Sullivan's island, which is situated so near the channel leading up to the town, as to be a convenient post for annoying vessels approaching it.

Sir Peter Parker attacked the fort on that island with two fifty gun ships, the Bristol and Experiment, four frigates, the Active, Acteon, Solebay and Syren, each of 28 guns. The Sphynx of 20 guns, the Friendship armed vessel of 22 guns, Ranger sloop, and Thunder bomb, each of 8 guns. On the fort were mounted 26 cannon, 26, 18 and 9 pounders. The attack commenced between ten and eleven in the forenoon, and was continued for upwards of ten hours. The garrison consisting of 375 regulars and a few militia, under the command of colonel Moultrie, made a most gallant defence. They fired deliberately, for the most part took aim and seldom missed their object. The ships were torn almost to pieces, and the killed and wounded on board exceeded 200 men. The loss of the garrison was only ten men killed and 22 wounded. The fort being built of palmetto was little damaged. The shot which struck it were ineffectually buried in its soft wood. General Clinton had some time before the engagement, landed with a number of troops on Long-Island, and it was expected that he would have co-operated with Sir Peter Parker, by crossing over the narrow passage, which divides the two islands, and attacking the fort in its unfinished rear; but the extreme danger to which he must unavoidably have exposed his men, induced him to decline the perilous attempt. Colonel Thomson with 7 or 800 men was stationed at the east-end of Sullivan's island to oppose their crossing. No serious attempt was made to land either from the fleet or the detachment commanded by Sir Henry Clinton. The firing ceased in the evening, and soon after the ships slipped their cables Before morning they had retired about two miles from the island. Within a few days more the troops re-embarked and sailed from New-York. The thanks of congress were given to General Lee, who had been sent on by congress to take the command in Carolina, and also to colonels Moultrie and Thomson, for their good conduct on this memorable day. In compliment to the commanding officer the fort from that time was called Fort Moultrie.

This year also, the Americans, having so frequently made trial of their valour by land, became desirous of trying

America.

trying it by ſea alſo, and of forming a navy that might in ſome meaſure be able to protect their trade, and do

231 Americans form a navy.

eſſential hurt to the enemy. In the beginning of March, Commodore Hopkins was diſpatched with five frigates to the Bahama iſlands, where he made himſelf maſter of the ordnance and military ſtores; but the gunpowder which had been the principal object, was removed. On his return he captured ſeveral veſſels; but was foiled in his attempt on the Glaſgow frigate, which found means to eſcape notwithſtanding the efforts of his whole ſquadron.

The time, however, was now come when the fortitude and patience of the Americans were to undergo a ſevere trial. Hitherto they had been on the whole ſucceſsful in their operations: but now they were doomed to experience misfortune, miſery, and diſappointment; the enemy over-running their country, and their own armies not able to face them in the field. The province of New-York, as being the moſt central colony, and

232 Armament ſent againſt New-York.

moſt acceſſible by ſea, was pitched upon for the object of the main attack. The force ſent againſt it conſiſted of 6 ſhips of the line, 30 frigates, beſides other armed veſſels, and a vaſt number of tranſports. The fleet was commanded by Lord Howe, and the land forces by his brother General Howe, who was now at Halifax. The latter, however, a conſiderable time before his brother arrived, had ſet ſail from Halifax, and lay before New-York, but without attempting to commence hoſtilities until he ſhould be joined by his brother. The Americans had, according to cuſtom, fortified New-York and the adjacent iſlands in an extra-

233 General Howe lands on Staten Iſland.

ordinary manner. However, General Howe was ſuffered to land his troops on Staten Iſland, where he was ſoon joined by a number of the inhabitants. About the middle of July, Lord Howe arrived with the grand armament; and being one of the commiſſioners appointed to receive the ſubmiſſion of the coloniſts, he publiſhed a circular letter to this purpoſe to the ſeveral governors who had lately been expelled from their provinces, deſiring them to make the extent of his commiſſion, and the powers he was inveſted with by parliament, as public as poſſible. Here, however, congreſs ſaved him trouble, by ordering his letter and declaration to be publiſhed in all the newſpapers, "That every one might ſee the inſidiouſneſs of the Britiſh miniſtry, and that they had nothing to truſt to beſides the exertion of their own valour."

234 General Waſhington refuſes a letter from Lord Howe.

Lord Howe next ſent a letter to General Waſhington; but as it was directed "To George Waſhington, Eſq." the General refuſed to accept of it, as not being directed in the ſtyle ſuitable to his ſtation. To obviate this objection, Adjutant-general Patterſon was ſent with another letter, directed "To George Waſhington, &c. &c. &c." But though a very polite reception was given to the bearer, General Waſhington utterly refuſed the letter; nor could any explanation of the adjutant induce him to accept of it. The only intereſting part of the converſation was that relating to the powers of the commiſſioners, of whom Lord Howe was one. The adjutant told him, that theſe powers were very extenſive: that the commiſſioners were determined to exert themſelves to the utmoſt, in order to bring about a reconciliation; and that he hoped the General would conſider this viſit as a ſtep towards it. General Waſhington replied, that it did not appear that

America.

theſe powers conſiſted in any thing elſe than granting pardons; and as America had committed no offence, ſhe aſked no forgiveneſs, and was only defending her unqueſtionable rights.

235 Hoſtilities commence.

The deciſion of every thing being now by conſent of both parties left to the ſword, no time was loſt, but hoſtilities commenced as ſoon as the Britiſh troops could be collected. This, however, was not done before the month of Auguſt; when they landed without any oppoſition on Long-Iſland, oppoſite to the ſhore of Staten-Iſland. General Putnam, with a large body of troops, lay encamped and ſtrongly fortified on a penin-

236 Situation of the Britiſh and American armies.

ſula on the oppoſite ſhore, with a range of hills between the armies, the principal paſs of which was near a place called *Flat-buſh*. Here the centre of the Britiſh army, conſiſting of Heſſians, took poſt; the left wing, under General Grant, lying near the ſhore; and the right, conſiſting of the greater part of the Britiſh forces, lay under Lord Percy, Cornwallis, and General Clinton. Putnam had ordered the paſſes to be ſecured by large detachments, which was executed as to thoſe at hand; but one of the utmoſt importance, that lay at a diſtance, was entirely neglected. This gave an opportunity to a large body of troops under Lord Percy and Clinton to paſs the mountains and attack the Americans in the rear, while they were engaged with the Heſſians in front. Through this piece of negligence their defeat became inevitable. Thoſe who were engaged with the Heſſians firſt perceived their miſtake, and began a retreat towards their camp; but the paſſage was intercepted by the Britiſh troops, who drove them back into the woods. Here they were met by the Heſſians; and thus they were for many hours ſlaughtered between the two parties, no way of eſcape remaining but by breaking through the Britiſh troops, and thus regaining their camp. In this at-

237 The Americans defeated with great ſlaughter.

tempt many periſhed; and the right wing, engaged with General Grant, ſhared the ſame fate. The victory was complete; and the Americans loſt on this fatal day (Auguſt 27th) conſiderably upwards of 1000 men, and two generals: ſeveral officers of diſtinction were made priſoners, with a number of privates. Among the ſlain, a regiment conſiſting of young gentlemen of fortune and family in Maryland, was almoſt entirely cut in pieces, and of the ſurvivers not one eſcaped without a wound.

The ardour of the Britiſh troops was now ſo great, that they could ſcarce be reſtrained from attacking the lines of the provincials; but for this there was now no occaſion, as it was certain they could not be defended. Of the Britiſh and Heſſians about 450 were loſt in this engagement.

238 They abandon their camp in the night.

As none of the American commanders thought it proper to riſk another attack, it was reſolved to abandon their camp as ſoon as poſſible. Accordingly, on the night of the 29th of Auguſt, the whole of the continental troops were ferried over with the utmoſt ſecrecy and ſilence; ſo that in the morning the Britiſh had nothing to do but take poſſeſſion of the camp and what artillery they had abandoned.

239 Lord Howe ſends a meſſage to congreſs.

This victory, though complete, was very far from being ſo deciſive as the conquerors imagined. Lord Howe, ſuppoſing that it would be ſufficient to intimidate the congreſs into ſome terms, ſent General Sullivan, who had been taken priſoner in the late action, to

America.

congress, with a message, importing, that though he could not consistently treat with them as a legal assembly, yet he would be very glad to confer with any of the members in their private capacity; setting forth at the same time the nature and extent of his powers as commissioner. But the congress were not so humbled as to derogate in the least from the dignity of character

240 And is waited on by a committee.

they had assumed. They replied, that the congress of the free and independent states of America could not consistently send any of its members in another capacity than that which they had publicly assumed; but as they were extremely desirous of restoring peace to their country upon equitable conditions, they would appoint a committee of their body to wait upon him, and learn what proposals he had to make.

This produced a new conference. The committee appointed by congress was composed of Dr Franklin, Mr Adams, and Mr Rutledge. They were very politely received by his Lordship; but the conference proved as fruitless as before independency had been declared; and the final answer of the deputies was, that they were extremely willing to enter into any treaty with Great Britain that might conduce to the good of both nations, but that they would not treat in any

241 The conference terminates ineffectually.

other character than that of independent states. This positive declaration instantly put an end to all hopes of reconciliation; and it was resolved to prosecute the war with the utmost vigour. Lord Howe, after publishing a manifesto, in which he declared the refusal of congress, and that he himself was willing to confer with all well disposed persons about the means of restoring public tranquillity, set about the most proper methods for reducing the city of New-York. Here the provincial troops were posted, and from a great number of batteries kept continually annoying the British shipping. The East River lay between them, of about 1200 yards in breadth, which the British troops were extremely desirous of passing. At last, the ships having, after an incessant cannonade of several days, silenced the most troublesome batteries, a body of troops was sent up the river to a bay, about three miles distant,

242 New-York abandoned by the provincials.

where the fortifications were less strong than in other places. Here, having driven off the provincials by the cannon of the fleet, they marched directly towards the city; but the Americans finding that they should now be attacked on all sides, abandoned the city, and retired to the north of the island, where their principal force was collected. In their passage thither they skirmished with the British, but carefully avoided a general engagement; and it was observed that they did not behave with that ardour and impetuous valour which had hitherto marked their character.

243 Situation of the British and American armies.

The British and provincial armies were not now above two miles distant from each other. The former lay encamped from shore to shore for an extent of two miles, being the breadth of the island, which, though 15 miles long, exceeds not two in any part in breadth. The provincials, who lay directly opposite, had strengthened their camp with many fortifications; at the same time being masters of all the passes and defiles betwixt the two camps, they were enabled to defend themselves against an army much more numerous than their own; and they had also strongly fortified a pass called *King's-Bridge*, whence they could secure a passage to the continent in case of any misfortune. Here General Washington, in order to inure the provincials to actual service, and at the same time to annoy the enemy as much as possible, employed his troops in continual skirmishes; by which it was observed that they soon recovered their spirits, and behaved with their usual boldness.

As the situation of the two armies was now highly inconvenient for the British generals, it was resolved to make such movements as might oblige General Washington to relinquish his strong situation. The possession of New-York had been less beneficial than was ex-

244 New-York set on fire.

pected. A few days after it was evacuated by the Americans, a dreadful fire broke out, occasioned, probably, by the licentious conduct of some of its new masters, and had it not been for the active exertions of the sailors and soldiery, the whole town might have been consumed, the wind being high, and the weather remarkably dry. About a thousand houses were destroyed. General Howe having left Lord Percy with sufficient force to garrison New-York, he embarked his army in flat-bottomed boats by which they were conveyed through the dangerous passage called *Hell-Gate*, and landed near the town of West-Chester, lying on the continent towards Connecticut. Here having received a supply of men and provisions, they moved to New-Rochelle, situated on the sound which separates Long-Island from the continent. After this receiving still fresh reinforcements, they made such movements as threatened to distress the provincials very much by cutting off their convoys of provisions from Connecticut, and thus force them to an engagement. This, however, General Washington determined at all events to avoid. He therefore extended his forces into a long

245 General Washington obliged to move farther from New-York.

line opposite to the way in which the enemy marched, keeping the Brunx, a river of considerable magnitude, between the two armies, with the North-River on his rear. Here again the provincials continued for some time to annoy and skirmish with the royal army, until at last, by some other manoeuvres, the British general found means to attack them advantageously at a place

246 Is defeated at the White Plains.

called the *White-Plains*, and drove them from some of their posts. The success on this occasion was much less complete than the former: however it obliged the provincials once more to shift their ground, and to retreat farther up the country. General Howe pursued for some time; but at last finding all his endeavours vain to bring the Americans to a pitched battle, he determined to give over such an useless chace, and employ himself in reducing the forts which the provincials still retained in the neighbourhood of New-York. In this he met with the most complete success. The Americans, on the approach of the king's forces, retreated from King's-Bridge into Fort-Washington; and this, as well as Fort-Lee, which lay in the neighbourhood, was quickly reduced, though the garrison made their

247 The Jerseys entirely over-run by the British troops.

escape. Thus the Jerseys were laid entirely open to the incursions of the British troops, and so fully were these provinces taken possession of by the royal army, that its winter-quarters extended from New-Brunswick to the river Delaware. Had any number of boats been at hand, it was thought Philadelphia would have fallen into their hands. All these, however, had been carefully removed by the Americans. In lieu of

248 Rhode-Island taken.

this enterprise, Sir Henry Clinton, undertook an expedition to Rhode-Island, and became master of it without losing a man. His expedition was also attended

with

America. with this further advantage, that the American fleet under commodore Hopkins was obliged to sail as far as possible up the river Providence, and thus remained entirely useless.

The same ill success continued to attend the Americans in other parts. After their expulsion from Canada, they had crossed the Lake Champlain, and taken up their quarters at Crown-Point, as we have already mentioned. Here they remained for some time in safety, as the British had no vessels on the lake, and consequently general Burgoyne could not pursue them. To remedy this deficiency, there was no possible method, but either to construct vessels on the spot, or take to pieces some vessels already constructed, and drag them up the river into the lake. This, however, was effected in no longer a space than three months; and the British general, after incredible toil and difficulty, saw himself in possession of a great number of vessels, by which means he was enabled to pursue his enemies, and invade them in his turn. The labour undergone at this time by the sea and land forces must indeed have been prodigious; since there were conveyed over land, and dragged up the rapids of St Lawrence, no fewer than thirty large long-boats, 400 batteaux, besides a vast number of flat-bottomed boats, and a gondola of 30 tons. The intent of the expedition was to push forward, before winter, to Albany, where the army would take up its winter-quarters, and next spring effect a junction with that under General Howe, when it was not doubted that the united force and skill of these two commanders would speedily put a termination to the war.

249 The British convey vessels up the lake Champlain.

By reason of the difficulties with which the equipment of this fleet had been attended, it was the beginning of October before the expedition could be undertaken. It was now, however, by every judge, allowed to be completely able to answer the purpose for which it was intended. It consisted of one large vessel with three masts, carrying 18 twelve-pounders; two schooners, the one carrying 14, the other 12 six pounders; a large flat bottomed radeau with six twenty-four and 6 twelve pounders; and a gondola with 8 nine pounders. Besides these, were 20 vessels of a smaller size, called *gun-boats*, carrying each a piece of brass ordnance from nine to twenty-four pounders, or howitzers. Several long-boats were fitted out in the same manner; and besides all these, there was a vast number of boats and tenders of various sizes to be used as transports for the troops and baggage. It was manned by a number of select seamen, and the guns were to be served by a detachment from the corps of artillery; the officers and soldiers appointed for this expedition were also chosen out of the whole army.

250 Destroy the naval force of the provincials.

To oppose this formidable armament the Americans had only a very inconsiderable force, commanded by general Arnold; who, after engaging part of the British fleet for a whole day, took advantage of the darkness of the night to set sail without being perceived, and the next morning was out of sight: but he was so hotly pursued by the British, that on the second day after, he was overtaken, and forced to a second engagement. In this he behaved with great gallantry; but his force being very inferior to that of the enemy, he was obliged to run his ships ashore and set them on fire. A few only escaped to lake George; and the garrison of Crown-Point having destroyed or carried off every thing of value, retired to Ticonderago. Thither general Carleton intended to have pursued them; but the difficulties he had to encounter appeared so many and so great, that it was thought proper to march back into Canada, and desist from any further operations till next spring.

251 The Americans almost entirely dispersed.

Thus the affairs of the Americans seemed every where going to wreck; even those who had been most sanguine in their cause began to waver. The time, also, for which the soldiers had enlisted themselves was now expired; and the bad success of the preceding campaign had been so very discouraging, that no person was willing to engage himself during the continuance of a war of which the event seemed to be so doubtful. In consequence of this, therefore, General Washington found his army daily decreasing in strength; so that, from 30,000, of which it consisted when general Howe landed on Staten Island, scarce a tenth-part could now be mustered. To assist the chief commander as much as possible, general Lee had collected a body of forces in the north; but on his way southward, having imprudently taken up his lodging at some distance from his troops, information was given to colonel Harcourt, who happened at that time to be in the neighbourhood, and Lee was made prisoner. The loss of this general was much regretted, the more especially as he was of superior quality to any prisoner in the possession of the colonists, and could not therefore be exchanged. Six field-officers were offered in exchange for him, and refused; and the congress was highly irritated at its being reported that he was to be treated as a deserter, having been a half-pay officer in the British service at the commencement of the war. In consequence of this they issued a proclamation, threatening to retaliate on the prisoners in their possession whatever punishment would be inflicted on any of those taken by the British, and especially that their conduct should be regulated by the treatment of general Lee.

252 General Lee taken prisoner.

253 Continental army for 1777.

In the mean time they proceeded with the most indefatigable diligence to recruit their army, and bound their soldiers to serve for a term of three years, or during the continuance of the war. The army designed for the ensuing campaign, was to consist of 88 battalions; of which each province was to contribute its quota; and 20 dollars were offered as a bounty to each soldier, besides an allotment of lands at the end of the war. No lands were promised to those who enlisted only for three years. All officers or soldiers disabled through wounds received in the service were to enjoy half-pay during life. To defray the expence, congress borrowed five millions of dollars at five per cent.; for the payment of which the United States became surety. At the same time, in order to animate the people to vigorous exertions, a declaration was published, in which they set forth the necessity there was for taking proper methods to insure success in their cause: they endeavoured to palliate as much as possible the misfortunes which had already happened; and represented the true cause of the present distress to be the short term of enlistment.

This declaration, together with the imminent danger of Philadelphia, determined the Americans to exert themselves to the utmost in order to reinforce ge-

neral

America. neral Washington's army, who, even in this time of depression and discouragement, formed the bold design of recrossing the Delaware, and attacking that part of the enemy which was posted at Trenton. As the Royal army extended in different cantonments for a great way, general Washington, perceiving the imminent danger to which Philadelphia was exposed, resolved to make some attempt on those divisions of the enemy which lay nearest that city. These happened to be the Hessians, who lay in three divisions, the last only 20 miles distant from Philadelphia. On the 25th of December, having collected as considerable a force as he could, he set out with an intent to surprise that body of the enemy which lay at Trenton. His army was divided into three bodies; one of which he ordered to cross the Delaware at Trenton Ferry, a little below the town: the second at a good distance below, at a place called *Bordentown*, where the second division of Hessians was placed; while he himself, with the third, directing his course to a ferry some miles above Trenton, intended to have passed it at midnight, and attack the Hessians at break of day. But by reason of various impediments, it was

254 The Hessians defeated at Trenton. eight in the morning before he could reach the place of his destination. The enemy, however, did not perceive his approach till they were suddenly attacked. Colonel Ralle, who commanded them, did all that could be expected from a brave and experienced officer; but every thing was in such confusion, that no efforts of valour or skill could now retrieve matters. The Colonel himself was mortally wounded, his troops were entirely broken, their artillery seized, and about 1000 taken prisoners. After this gallant exploit, General Washington again returned into Pennsylvania.

This action, though seemingly of no very decisive nature, was sufficient at that time to turn the fortune of war in favour of America. It tended greatly to lessen the apprehensions which the provincials had of the Hessians, at the same time that it equally abated the confidence which the British had till now put in them.

Reinforcements came in from several quarters to General Washington, so that he was soon in a condition once more to pass the Delaware, and take up his quarters at Trenton, where he was emboldened to maintain his station, notwithstanding the accounts that were received of the enemy's rapid advance towards him. Lord Cornwallis, accordingly, made his appearance in full force; and, on the evening of his arrival, the little town of Trenton contained the two hostile armies, separated only by a small creek, which was fordable in many places. This was, indeed the crisis of the American revolution; and had his Lordship made an immediate attack, in pursuance of what is reported to have been the advice of Sir William Erskine, General Washington's defeat seems to have been inevitable: but a night's delay turned the fate of the war, and produced an enterprise, the magnitude and glory of which, can only be equalled by its success. General Washington having called a council of war, stated the calamitous situation to which his army was reduced; and having

255 Gen. Washington marches his army to Princeton. heard the various opinions of his officers, finally proposed a circuitous march to Princeton, as the means of avoiding, at once, the imputation of a retreat, and the danger of a battle, with numbers so inferior, and in a situation so ineligible. The idea was unanimously approved; and, as soon as it was dark, the necessary measures were taken for accomplishing it. A line of fires was kindled, which served to give light to the Americans, while it obscured them from the observation of the enemy: and by a providential interposition, the weather, which had been for some time past warm, moist, and foggy, suddenly changed to a hard frost; and, in a moment as it were, rendered the road, which had been deep and heavy, firm and smooth as a pavement. At break of day General Washington arriving near Princeton, was discovered by a party of British troops, consisting of three regiments under the command of Col. Mawhood, who were on their march to Trenton. With these the centre of the Americans engaged, and after killing 60, wounding many, and taking 300 prisoners, obliged the rest to make a precipitate escape, some towards Trenton, and others in a retrograde rout to Brunswick. The loss of the Americans was inconsiderable in point of numbers; but the fall of the amiable General Mercer rendered it important. The British astonished and discouraged at the success and spirit of these repeated enterprizes, abandoning both Trenton and Princeton, retreated to Brunswick; while the triumphant Americans retired to Morristown. General Washington, however, omitted no opportunity of recovering what had been lost; and by dividing his army into small parties, which could be reunited on a few hours warning, he in a manner entirely covered the country with it, and repossessed himself of all the important places.

256 British defeated at Princeton;

257 And retreat to Brunswick.

Thus ended the campaign of 1776, with scarce any other real advantage than the acquisition of the city of New York, and of a few fortresses in its neighbourhood; where the troops were constrained to act with as much circumspection as if they had been besieged by a victorious army, instead of being themselves the conquerors.

The army at New-York began in 1777 to exercise a kind of predatory war, by sending out parties to destroy magazines, make incursions, and take or destroy such forts as lay on the banks of rivers, to which their great command of shipping gave them access. In this they were generally successful: the provincial magazines at Peek's Hill, a place about 50 miles distant from New-York, were destroyed, the town of Dunbury in Connecticut burnt, and that of Ridgefield in the same province was taken possession of. In returning from the last expedition, however, the British were greatly harrassed by the Americans under Generals Arnold, Wooster, and Sullivan; but they made good their retreat, though with the loss of above 200 killed and wounded. On the American side the loss was considerable; General Wooster was killed, and Arnold in the most imminent danger. On the other hand, the Americans destroyed the stores at Stagg-harbour, in Long-Island, and made prisoners of all who defended the place.

258 Excursions of the British from New York.

As this method of making war, however, could answer but little purpose, and savoured more of the barbarous incursions of savages than of a war carried on by a civilized people, it was resolved to make an attempt on Philadelphia. At first it was thought that this could be done through the Jerseys; but the cruelties exercised by the British plundering parties had excited so general an abhorrence, and General Washington had

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had received such large reinforcements, and posted himself so strongly, that it was found to be impracticable. Many stratagems were used to draw him from his strong situation, but without success; so that it was found necessary to make the attempt on Philadelphia by sea. While the preparations necessary for this expedition were going forward, the Americans found means to make amends for the capture of General Lee by that

259 General Prescot taken prisoner.

of General Prescot, who was seized in his quarters with his aid de camp, in much the same manner as General Lee had been. This was exceedingly mortifying to the General himself, as he had not long before set a price upon General Arnold, by offering a sum of money to any one that apprehended him; which the latter answered by setting a lower price upon General Prescot.

The month of July was far advanced before the preparations for the expedition against Philadelphia were completed; and it was the 23d before the fleet was

260 The fleet sails for Philadelphia.

able to sail from Sandy-Hook. The force employed in this expedition consisted of 36 battalions of British and Hessians, a regiment of light horse, and a body of loyalists raised at New-York. The remainder of these, with 17 battalions, and another body of light horse, were stationed at New-York under Sir Henry Clinton. Seven battalions were stationed at Rhode-Island. After a week's sailing they arrived at the mouth of the Delaware; but there having received certain intelligence, that the navigation of the river was so effectually obstructed, that no possibility of forcing a passage remained; or more probably that Gen. Washington had marched within a short distance of Philadelphia; it was resolved to preceed further southward to Chesapeak Bay in Maryland, from whence the distance to Philadelphia was not very great, and where the provincial army would find less advantage from the nature of the country than in the Jerseys.

The navigation from Delaware to Chesapeak took up the best part of the month of August, and that up the bay itself was extremely difficult and tedious. At

261 The army lands at the head of the Elk.

last, having sailed up the river Elk, as far as was practicable, the troops were landed without opposition, and set forward on their intended expedition. On the news of their arrival at Chesapeak, General Washington left the Jerseys, and hastened to the relief of Philadelphia; and in the beginning of September met the royal army at Brandy-wine Creek about mid-way, between the head of the Elk and Philadelphia. Here he adhered to his former method of skirmishing and harassing the royal army on its march; but as this proved insufficient to stop its progress, he retired to that side of the creek next to Philadelphia, with an intent to dispute the passage. This brought on a general engagement on the 11th September. The royal army advanced at day break in two columns, commanded by lieutenant general Knyphausen, and by lord Cornwallis. The first took the direct road to Chadd's Ford, and made a shew of passing it, in front of the main body of the Americans. At the same time the other column moved up on the west side of the Brandywine to its fork, and crossed both its branches about 2 o'clock in the afternoon, and then marched down on the east side thereof, with the view of turning the right wing of their adversaries.

This they effected and compelled them to retreat with great loss. General Knyphausen amused the Americans with the appearance of crossing the ford, but did not attempt it until lord Cornwallis having crossed above and moved down on the opposite side, had commenced his attack. Knyphausen then crossed the ford, and attacked the troops posted for its defence. These, after a severe conflict, were compelled to give

262 Americans defeated.

way. The retreat of the Americans soon became general, and was continued to Chester, under cover of general Weeden's brigade, which came off in good order. The final issue of battles often depends on small circumstances, which human prudence cannot control---one of these occurred here, and prevented general Washington from executing a bold design, to effect which, his troops were actually in motion. This was to have crossed the Brandywine, and attacked Knyphausen, while general Sullivan and lord Stirling, should keep earl Cornwallis in check. In the most critical moment, general Washington received intelligence which he was obliged to credit, that the column of lord Cornwallis had been only making a feint, and was returning to join Knyphausen. This prevented the execution of a plan, which, if carried into effect, would probably have given a different turn to the events of the day. The killed and wounded in the royal army, were near six hundred. The loss of the Americans was twice that number. The celebrated Marquis de la Fayette here first bled in the cause of liberty, which he had espoused with enthusiastic ardor. His wound was slight, but it endeared him to the Americans.

The loss of this battle proved also the loss of Philadelphia. General Washington retired towards Lancaster, to save the stores which had been deposited at Reading. But though he could not prevent the loss of Philadelphia, he still adhered to his original plan of

263 An American detachment surprised and defeated with great slaughter.

distressing the royal party, by laying ambushes and cutting off detached parties; but in this he was less successful than formerly; and one of his one detachments which lay in ambush in a wood were themselves surprised and entirely defeated, with the loss of 300 killed and wounded, besides 70 or 80 taken, and all their arms and baggage.

264 General Howe takes possession of Philadelphia.

General Howe now perceiving that the Americans would not venture another battle even for the sake of their capital, took peaceable possession of it on the 26th of September. His first care was then to cut off, by means of strong batteries, the communication between the upper and lower parts of the river; which was executed, notwithstanding the opposition of some American armed vessels; one of which, carrying 36 guns, was taken. His next task was to open a communication with it by sea; and this was a work of no small difficulty. A vast number of batteries and forts had been erected, and immense machines formed like *chevaux de frize*, from whence they took their name, sunk in the river to prevent its navigation. As the fleet was sent round to the mouth of the river in order to co-operate with the army, this work, however difficult, was accomplished; nor did the provincials give much opposition, as well knowing that all places of this kind were now untenable. General

265 Royal army attacked at Germantown.

Washington, however, took the advantage of the royal army being divided to attack the camp of the principal division of it that lay at German town, in the neighbourhood of Philadelphia. In this he met with very little success; for though he reached the place of destination

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nation by three o'clock in the morning, the patroles had time to call the troops to arms. The Americans, notwithstanding made a very resolute attack: but they were received with so much bravery, that they were compelled to abandon the attempt, and retreat in great disorder; with the advantage, however, of carrying off their cannon, though pursued for a considerable way, after having upwards of 200 killed, and about 500 wounded, and upwards of 400 taken prisoners, among whom were 54 officers. On the British side, the loss amounted to 430 wounded and prisoners, and 70 killed but among the last were General Agnew and Colonel Bird, with some other excellent officers.

266 The Americans repulsed.

Ramsay's History, Vol. II. p. 17.

The British were well apprized, that without the command of the Delaware, their possession of Philadelphia would be of no advantage. They therefore strained every nerve, to open the navigation of that river,---to this end lord Howe had early taken the most effectual measures for conducting the fleet and transports round from the Chesapeak to the Delaware, and drew them up on the Pennsylvania shore, from Reedy-Island to New Castle. Early in October, a detachment from the British army crossed the Delaware, with a view of dislodging the Americans from Billingsport. On their approach, the place was evacuated. As the season advanced, more vigorous measures for removing the obstructions were concerted between the general and the admiral. Batteries were erected on the Pennsylvania shore to assist in dislodging the Americans from Mud-Island. At the same time Count Donop with 2000 men, having crossed into New-Jersey, opposite to Philadelphia, marched down on the eastern side of the Delaware, to attack the redoubt at Red-Bank. This was defended by about 400 men under the command of colonel Greene. The attack immediately commenced by a smart cannonade; under cover of which the Count advanced to the redoubt. This place was intended for a much larger garrison than was then in it. It had therefore become necessary to run a line in the middle thereof, and one part of it was evacuated. That part was easily carried by the assailants on which they indulged in loud huzzas for their supposed victory. The garrison kept up a severe well directed fire on the assailants by which they were compelled to retire. They suffered not only in the assault, but in the approach to, and retreat from the fort. There whole loss in killed and wounded was about 400. Count Donop was mortally wounded and taken prisoner. Congress resolved to present colonel Greene with a sword for his good conduct on this occasion. An attack made about the same time on fort Mifflin by men of war and frigates, was not more successful than the assault on Red-Bank. The Augusta man of war of 64 guns, and the Merlin, two of the vessels which were engaged in it, got a ground. The former was fired and blew up. The latter was evacuated.

267 British ships of war burnt.

Though the first attempts of the British, for opening the navigation of the Delaware, were unsuccessful, they carried their point in another way that was unexpected. The chevaux de frise, having been sunk some considerable time, the current of the water was diverted by this great bulk into new channels. In consequence thereof the passage between the islands and the Pennsylvania shore was so deepened as to admit vessels of some considerable draught of water. Through this passage, the Vigilant, a large ship, cut down so as to draw but little water, mounted with 24 pounders, made her way to a position from which she might enfilade the works on Mud-Island. This gave the British such an advantage, that the post was no longer tenable. Colonel Smith, who had with great gallantry defended the fort from the latter end of September, to the 11th of November, being wounded, was removed to the main. Within five days after his removal, major Thayer, who as a volunteer had nobly offered to take charge of this dangerous post, was obliged to evacuate it.

This event did not take place till the works were entirely beat down---every piece of cannon dismounted, and one of the British ships so near that she threw granadoes into the fort, and killed the men uncovered in the platform. The troops who had so bravely defended fort Mifflin, made a safe retreat to Red-Bank. Congress voted swords to be given to lieutenant colonel Smith and Commodore Hazlewood, for their gallant defence of the Delaware. Within three days after Mud-Island was evacuated, the garrison was also withdrawn from Red-Bank, on the approach of lord Cornwallis, at the head of a large force prepared to assault it. Some of the American gallies and armed vessels escaped by keeping close in with the Jersey shore, to places of security above Philadelphia, but 17 of them were abandoned by their crews, and fired. Thus the British gained a free communication between their army and shipping. This event was to them very desirable. They had been previously obliged to draw their provisions from Chester, a distance of sixteen miles, at some risque, and a certain great expence. The long protracted defence of the Delaware, deranged the plans of the British, for the remainder of the campaign, and consequently saved the adjacent country.

268 All the forts near Philadelphia reduced.

Thus the campaign of 1777, in Pensylvania, concluded, upon the whole, successfully on the part of the British. In the north, however, matters wore a different aspect. The expedition in that quarter had been projected by the British ministry as the most effectual method that could be taken to crush the colonies at once. The four provinces of New-England had originally begun the confederacy against Britain, and were still considered as the most active in the continuation of it; and it was thought, that any impression made upon them, would contribute in an effectual manner to the reduction of all the rest. For this purpose, an army of 4000 chosen British troops and 3000 Germans were put under the command of General Burgoyne; General Carleton was directed to use his interest with the Indians to persuade them to join in this expedition; and the province of Quebec was to furnish large parties to join in the same. The officers who commanded under General Burgoyne were, General Philips of the artillery, Generals Fraser, Powell, and Hamilton, with the German officers General Reidesel and Speecht. The soldiers, as has already been observed, were all excellently disciplined, and had been kept in their winter-quarters with all imaginable care, in order to prepare them for the expedition on which they were going. To aid the principal expedition, another was projected on the Mohawk River under Colonel St Leger, who was to be assisted by Sir John Johnson, son to the

269 Expedition projected against New-England.

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the famous Sir William Johnson who had so greatly distinguished himself in the war of 1755.

270 Americans defeated by land and water.

On the 21st of June 1777, the army encamped on the western side of the Lake Champlain; where, being joined by a considerable body of Indians, General Burgoyne made a speech, in which it is said he exhorted these new allies, but ineffectually, to lay aside their ferocious and barbarous manner of making war; to kill only such as opposed them in arms; and to spare prisoners, with such women and children as should fall into their hands. After issuing a proclamation, in which the force of Britain, and that which he commanded, was set forth in very ostentatious terms, the campaign opened with the siege of Ticonderago. The place was very strong, and garrisoned by 6000 men under General St Clair; nevertheless, the works were so extensive, that even this number was scarce sufficient to defend them properly. They had therefore omitted to fortify a rugged eminence called *Sugar-Hill*, the top of which overlooked and effectually commanded the whole works; imagining, perhaps, that the difficulty of the ascent would be sufficient to prevent the enemy from taking possession of it. On the approach of the first division of the army, the provincials abandoned and set fire to their outworks; and so expeditious were the British troops, that by the 5th of July every post was secured which was judged necessary for investing it completely. A road was soon after made to the very summit of that eminence which the Americans had supposed could not be ascended; and so much were they now disheartened, that they instantly abandoned the fort entirely, taking the road to Skenesborough, a place to the south of Lake George; while their baggage, with what artillery and military stores they could carry off, were sent to the same place by water. But the British generals were determined not to let them pass so easily. Both were pursued and both overtaken. Their armed vessels consisted only of five galleys; two of which were taken, and three blown up; on which they set fire to their boats and fortifications at Skenesborough. On this occasion the provincials lost 200 boats, 130 pieces of cannon, with all their provisions and baggage. Their land-forces under Colonel Francis made a brave defence against General Fraser; and superior in number, had almost overpowered him, when General Reidesel with a large body of Germans came to his assistance. The provincials were now overpowered in their turn; and their commander being killed, they fled on all sides with great precipitation. In this action 200 Americans were killed, as many taken prisoners, and above 600 wounded, many of whom perished in the woods for want of assistance.

271 General Burgoyne joined by the Indians.

272 Ticonderago besieged and taken.

During the engagement General St Clair was at Castleton, about six miles from the place; but instead of going forward to Fort Anne, the next place of strength, he repaired to the woods which lie between that fortress and New-England. General Burgoyne, however, detached Colonel Hill with the ninth regiment in order to intercept such as should attempt to retreat towards Fort Anne. On his way he met with a body of the Americans more numerous than his own; but after an engagement of three hours, they were obliged to retire with great loss. After so many disasters, despairing of being able to make any stand at Fort Anne, they set fire to it and retired to Fort Edward. In all these engagements the loss of killed and wounded in the royal army did not exceed 200 men.

273 They are again defeated, and abandon Fort Anne.

General Burgoyne was now obliged to suspend his operations for some time, and wait at Skenesborough for the arrival of his tents, provisions, &c. but employed this interval in making roads through the country about St Anne, and in clearing a passage for his troops to proceed against the Americans. This was attended with incredible toil; but all obstacles were surmounted with equal patience and resolution by the army. In short, after undergoing the utmost difficulty and making every exertion, he arrived with his army before Fort Edward about the end of July. Here General Schuyler had been for some time endeavouring to recruit the shattered American forces, and had been joined by General St Clair with the remains of his army; the garrison of Fort George also, situated on the lake of that name, had evacuated the place and retired to Fort Edward.

274 General Burgoyne makes his way to Fort Edward with great difficulty.

275 Americans retire to Saratoga.

But on the approach of the royal army, they retired from thence also, and formed their head-quarters at Saratoga. Notwithstanding the great success of the British general, they showed not the least disposition to submit, but seemed only to consider how they might make the most effectual resistance. For this purpose, the militia was every where raised and draughted to join the army at Saratoga; and such numbers of volunteers were daily added, that they soon began to recover from the alarm into which they had been thrown. That they might have a commander whose abilities could be relied on, General Arnold was appointed, who repaired to Saratoga with a considerable train of artillery; but receiving intelligence that Colonel St Leger was proceeding with great rapidity in his expedition on the Mohawk River, he removed to Still water, a place about half way between Saratoga and the junction of the Mohawk and Hudson's River. The Colonel, in the mean time, had advanced as far as Fort Stanwix; the siege of which he pressed with great vigour. On the 6th of August, understanding that a supply of provisions, escorted by 800 or 900 men, was on the way to the fort, he dispatched Sir John Johnson with a strong detachment to intercept it. This he did so effectually, that, besides intercepting the provisions, 400 of its guard were slain, 200 taken, and the rest escaped with great difficulty. The garrison, however, were not to be intimidated by the threats or representations of the Colonel: on the contrary, they made several successful sallies under Colonel Willet, the second in command; and this gentleman, in company with another, even ventured out of the fort, and, eluding the vigilance of the enemy, passed throuhg them in order to hasten the march of General Arnold to their assistance.

276 Fort Stanwix besieged.

277 A detachment of Americans cut in pieces.

278 The Indians desert and force the colonel to raise the siege.

Thus the affairs of Colonel St Leger seemed to be in no very favourable situation notwithstanding his late success, and they were soon totally ruined by the desertion of the Indians. They had been alarmed by the report of General Arnold's advancing with 2000 men to the relief of the fort; and while the Colonel was attempting to give them encouragement, another report was spread, that General Burgoyne had been defeated with great slaughter, and was now flying before the provincials. On this he was obliged to do as they thought proper; and the retreat could not be effected

without

America.

without the loss of the tents, the artillery and military stores.

279 General Burgoyne distressed for want of provisions.

General Burgoyne, in the mean time, notwithstanding all the difficulties he had already sustained, found that he must still encounter more. The roads he had made with so much labour and pains were destroyed, either by the wetness of the season or by the Americans; so that the provisions he brought from Fort George could not arrive at his camp without the most prodigious toil. On hearing of the siege of Fort Stanwix by Colonel St Leger, he determined to move forward, in hopes of inclosing the enemy betwixt his own army and that of St Leger, or of obtaining the command of all the country between Fort Stanwix and Albany; or, at any rate, a junction with Colonel St Leger would be effected, which could not but be attended with the most happy consequences. The only difficulty was the want of provisions; and this it was proposed to remedy by

280 Makes an attempt on the provincial magazines at Bennington.

reducing the provincial magazines at Bennington. For this purpose, Colonel Baum, a German officer of great bravery, was chosen with a body of 500 men. The place was about 20 miles from Hudson's River; and to support Colonel Baum's party, the whole army marched up the river's bank, and encamped almost opposite to Saratoga, with the river betwixt it and that place. An advanced party was posted at Batten Kill, between the camp and Bennington, in order to support Colonel Baum. In their way the British seized a large supply of cattle and provisions, which were immediately sent to the camp; but the badness of the roads retarded their march so much, that intelligence of their design was sent to Bennington. Understanding now that the American force was greatly superior to his own, the Colonel acquainted the General, who immediately dispatched Colonel Breyman with a party to his assistance; but through the same causes

281 Colonel Baum utterly defeated and taken prisoner.

that had retarded the march of Colonel Baum, this assistance could not arrive in time. General Starke who commanded the American militia at Bennington, engaged with them before the junction of the two royal detachments could be effected. On this occasion about 800 undisciplined militia, without bayonets, or a single piece of artillery, attacked and routed 500 regular troops advantageously posted behind entrenchments —furnished with the best arms, and defended with two pieces of artillery. The field pieces were taken from the party commanded by Col. Baum, and the greatest part of his detachment was either killed or captured. Colonel Breyman arrived on the same ground and on the same day, but not till the action was over. Instead of meeting his friends, as he expected, he found himself briskly attacked. This was begun by colonel Warner, (who with his continental regiment, which having been sent for from Manchester, came opportunely at this time) and was well supported by Stark's militia, which had just defeated the party

282 Colonel Breyman defeated.

commanded by colonel Baum. Breyman's troops, though fatigued with their preceding march, behaved with great resolution, but were at length compelled to abandon their artillery and retreat. In these two actions the Americans took four brass field pieces, twelve brass drums, 250 dragoon swords, 4 ammunition waggons, and about 700 prisoners. The loss of the Americans, inclusive of their wounded, was about 100 men.

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General Burgoyne, thus disappointed in his attempt on Bennington, applied himself with indefatigable diligence to procure provisions from Fort George; and having at length amassed a sufficient quantity to last for a month, he threw a bridge of boats over the river Hudson, which he crossed about the middle of September, 283

283 The Americans attack the Royal army,

encamping on the hills and plains near Saratoga. As soon as he approached the provincial army, at this time encamped at Stillwater under General Gates, he determined to make an attack; for which purpose he put himself at the head of the central division of his army, having General Fraser and Colonel Breyman on the right, with Generals Reidesel and Philips on the left. In this position he advanced on the 19th of September. But the Americans did not now wait to be attacked: on the contrary they attacked the central division with the utmost violence; and it was not

284 And are with great difficulty repulsed.

until General Philips with the artillery came up, and at eleven o'clock at night, that they could be induced to retire to their camp. On this occasion, the British troops lost about 500 in killed and wounded, and the Americans about 319. The former were very much alarmed at the obstinate resolution shown by the Americans, but this did not prevent them from advancing, and posting themselves the next day within canon-shot of their lines.

285 The Indians desert.

But their allies the Indians began to desert in great numbers; and at the same time the general was in the highest degree mortified by having no intelligence of any assistance from Sir Henry Clinton, as had been stipulated.

286 A letter from Sir Henry Clinton, with General Burgoyne's answer.

He now received a letter from him by which he was informed that Sir Henry intended to make a diversion on the North River in his favour. This afforded but little comfort: however, he returned an answer by several trusty persons whom he dispatched different ways, stating his present distressed situation, and mentioning that the provisions and other necessaries he had would only enable him to hold out until the 12th of October.

287 Expedition of the provincials against Ticonderago.

In the mean time the Americans, in order to cut off the retreat of the British army in the most effectual manner, undertook an expedition against Ticonderago; but were obliged to abandon the enterprise after having surprised all the out-posts, and taken a great number of boats with some armed vessels, and a number of prisoners. The army under general Burgoyne, however, continued to labour under the greatest distresses; so that in the beginning of October he had been obliged to diminish the soldiers allowance. On the 7th of that month he determined to move towards the enemy. For this purpose he sent a body of 1500 men to reconnoitre their left wing; intending, if possible, to break

288 They make a bold attack on the royal army,

through it in order to effect a retreat. The detachment, however, had not proceeded far when a spirited attack was made upon the left wing of the British army, which was with great difficulty preserved from being entirely broken by a reinforcement brought up

289 Kill General Fraser,

by general Fraser, who was killed in the attack. After the troops had with the most desperate efforts regained their camp, it was most vigorously assaulted by general Arnold; who, notwithstanding all opposition, would have forced the entrenchments, had he not re-

290 And defeat the Germans with great slaughter.

ceived a dangerous wound, which obliged him to retire. Thus the attack failed on the left, but on the right the camp of the German reserve was forced, Colonel Breyman killed, and his countrymen defeat-

ed

America. ed with great slaughter, and the loss of all their artillery and baggage.

This was by far the heaviest loss the British army had sustained since the action at Bunker's Hill. The list of killed and wounded amounted to near 1200, exclusive of the Germans; but the greatest misfortune was, that the Americans had now an opening on the right and rear of the British forces, so that the army was threatened with entire destruction. This obliged General Burgoyne once more to shift his position, that the Americans might also be obliged to alter theirs. This was accomplished on the night of the 7th, without any loss, and all the next day he continued to offer the Americans battle; but they were now too well assured of obtaining a complete victory, by cutting off all supplies from the British, to risk a pitched battle. Wherefore they advanced on the right side, in order to inclose him entirely; which obliged the General to direct a retreat towards Saratoga. But the Americans had now stationed a great force on the ford at Hudson's river, so that the only possibility of retreat was by securing a passage to Lake George; and to effect this, a body of workmen were detached, with a strong guard, to repair the roads and bridges that led to Fort Edward. As soon as they were gone, however, the Americans seemed to prepare for an attack; which rendered it necessary to recal the guard, and the workmen being of course left exposed, could not proceed.

291 The royal army in danger of being surrounded.

292 Attempts a retreat without success.

In the mean time, the boats which conveyed provisions down Hudson's river were exposed to the continual fire of the American marksmen, who took many of them; so that it became necessary to convey the provisions over land. In this extreme danger, it was resolved to march by night to Fort Edward, forcing the passages at the fords either above or below the place; and, in order to effect this the more easily, it was resolved that the soldiers should carry their provisions on their backs, leaving behind their baggage and every other incumbrance. But before this could be executed, intelligence was received that the Americans had raised strong entrenchments opposite to these fords, well provided with cannon, and that they had likewise taken possession of the rising ground between Fort George and Fort Edward, which in like manner was provided with canon.

293 Distressed situation of the royal army.

All this time the American army was increasing by the continual arrival of militia and volunteers from all parts. Their parties extended all along the opposite bank of Hundson's River, and some had even passed it in order to observe the least movement of the British army. Every part of the British camp was reached by the grape and rifle-shot of the Americans, besides a discharge from their artillery, which was almost incessant. In this state of extreme distress and danger, the army continued with the greatest constancy and perseverance till the evening of the 13th of October, when an inventory of provisions being taken, it was found that no more remained than what were sufficient to serve for three days; and a council of war being called, it was unanimously determined that there was no method now remaining but to treat with the Americans. In consequence of this, a negociation was opened next day, which speedily terminated in a capitulation of the whole British army; the articles of which were 1. The troops under lieut. gen. Burgoyne, to march out of their camp with the honours of war, and the artillery of the intrenchments to the verge of the river where the old fort stood, where the arms and artillery are to be left.—The arms to be piled by word of command from their own officers:—2. A free passage to be granted to the army under liet. gen. Burgoyne to Great-Britain, upon condition of not serving again in North-America during the present contest; and the port of Boston to be assigned for the entry of transports, to receive the troops whenever gen. Howe shall so order:—3. Should any cartel take place, by which the army under lieut. gen. Burgone, or any part of it, may be exchanged, the foregoing article to be void, as far as such exchange shall be made:—4. The army under lieut. gen. Burgoyne to march to Massachusetts-Bay, by the easiest, and most expeditious and convenient route; and to be quartered in, near, or as convenient as possible to Boston, that the march of the troops may not be delayed when transports arrive to receive them:—The troops to be supplied on the march, and during their being in quarters, with provisions, by major general Gates's orders, at the same rate of rations as the troops of his own army; and, if possible, the officers horses and cattle are to be supplied with forage at the usual rates:—6. All the officers to retain their caraiages, bat-horses and other cattle, and no baggage to be molested or searched; lieut. gen. Burgoyne giving his honour, that there are no public stores contained therein. Major gen. Gates will of course take the necessary measures for the due performance of this article: should any carriages be wanted during the march, for the transportation of officers baggage, they are, if possible, to be supplied by the country at the usual rates:—7. Upon the march, and during the time the army shall remain in quarters, in the Massachusetts-Bay, the officers are not, as far as circumstances will admit, to be separated from their men.—The officers are to be quartered according to their rank, and are not to be hindered from their assembling their men for roll-callings, and other necessary purposes of regularity:—8. All corps whatever of lieut. gen. Burgoyne's army, whether composed of sailors, batteau-men, artificers, drivers, independent companies, and followers of the army, of whatever country, shall be included in the fullest sense and utmost extent of the above articles, and comprehended in every respect as British subjects:—9. All Canadians, and persons belonging to the Canadian establishment, consisting of sailors, batteau-men, artificers, drivers, independent companies, and many other followers of the army, who come under no particular description, are to be permitted to return there: they are to be conducted immediately, by the shortest route, to the first British post on Lake George, are to be supplied with provisions in the same manner as the other troops, and to be bound by the same condition of not serving during the present contest in North-America:—10. Passports to be immediately granted for three officers, not exceeding the rank of captains, who shall be appointed by lieut. gen. Burgoyne, to carry dispatches to Sir Wm. Howe, Sir Guy Carleton, and to Great-Britain by the way of New-York; and major general Gates engages the public faith, that these dispatches shall not be opened. These officers are to set out immedi-

294 It is obliged to capitulate,

America. ately after receiving their dispatches, and are to travel by the shortest route, and in the most expeditious manner:—11. During the stay of the troops in the Massachusetts-Bay, the officers are to be admitted on parole, and are to be permitted to wear their side arms:—12. Should the army under lieut. gen. Burgoyne, find it necessary to send for their cloathing and other baggage from Canada, they are to be permitted to do it in the most convenient manner, and necessary passports to be granted for that purpose:—13. These articles are to be mutually signed and exchanged to-morrow morning at nine o'clock; and the troops under lieut. gen. Burgoyne, are to march out of their intrenchments at three o'clock in the afternoon. Camp at Saratoga, October 16, 1777.

HORATIO GATES, Major-General.

To prevent any doubts that might arise from lieut. gen. Burgoyne's name not being mentioned in the above treaty, major general Gates hereby declares, that he is understood to be comprehended in it, as fully as if his name had been specifically mentioned.

HORATIO GATES.

Such was the impatience of some of the militia to return home before the royal army had been brought to surrender, and so little their concern to be spectators of the event, that one of the Northampton regiments went off the day before the flag came out from Burgoyne. Another regiment took itself away while the treaty was in agitation. But the fate of the army will confirm the truth of what its commander wrote to lord George Germain, August the 20th, "the great bulk of the country is undoubtedly with the congress in principle and zeal." When after the convention the officers went into the American camp, they were surprised; and some of them said, that of all the camps they had ever seen in Germany, or elsewhere, they never saw any better disposed and secured.

The return signed by gen. Burgoyne, of the foreigners at the time of the convention, amounted to 2412. The British consisted, according to him, of 10 officers present—145 commissioned—the staff 26—sergeants and drummers 297—rank and file 2901—in all 3379: this added to the Germans, makes 5791. The American account, to show what was the sum total of the royal army acting in the northern department against the country, goes on to reckon, the sick taken 928—the wounded 528—prisoners of war before the convention 400—deserters 300—lost at Bennington 1220—killed between the 17th of September and the 18th of October 600—taken at Tyconderoga 413—killed in gen. Herkimer's battle about 300—making in all 4689. According to this way of reckoning, the royal force was 10480. It was probably full 10,000 strong, including Canadians and provincials, and exclusive of Indians, drivers, sutlers, &c. Among the prisoners taken were six members of parliament.

The train of brass artillery was a fine acquisition; it consisted of 2 twenty-four pounders—4 twelves—20 sixes—6 threes—2 eight inch howitzers—5 five and a half royal ditto—and three five and a half inch royal mortars—in all, 42 pieces of ordnance. There were also 4647 muskets—6000 dozen of cartridges, beside shot, carcasses, cases, shells, &c.

Burgoyne was desirous of a general return of the army commanded by Gates at the time of the convention. The latter understood him, and was careful not to lessen the return by suppressing a single man. The continentals, all ranks included, were 9093; the militia 4129, in all 13222; but of the former, the sick and on furlough were 2103; and of the latter, 562. The number of the militia was continually varying; and many of them were at a considerable distance from the camp.

295 Successful expedition of Sir Henry Clinton.

Sir Henry Clinton, in the mean time, had sailed up the North River, and destroyed the two forts called Montgomery and Clinton, with Fort Constitution, and another place called Continental Village, where were barracks for 2000 men. Seventy large cannon were carried away, besides a number of smaller artillery, and a great quantity of stores and ammunition; a large boom and chain reaching across the river from Fort Montgomery to a point of land called St Anthony's Nose, and which cost not less than L. 70,000 Sterling, were partly destroyed and partly carried away, as was also another boom of little less value at Fort Constitution. The loss of the British army was but small in number, though some officers of great merit were killed in the different attacks.

Another attack was made by Sir James Wallace with some frigates, and a body of land-forces under General Vaughan. The place which now suffered was named Esopus: the fortifications were destroyed, and the town itself was wantonly reduced to ashes, as that called Continental Village had been before. Thus the British armament spent their time in wasting the adjacent country, when by pushing forward 136 miles in six days they might have effectually relieved Burgoyne.

296 Great dejection on account of Burgoyne's capture.

But these successes, of whatever importance they might be, were now disregarded by both parties. They served only to irritate the Americans, flushed with their success; and they were utterly insufficient to raise the spirits of the British, who were now thrown into the utmost dismay.

297 Treaty between France and America.

On the 16th of March 1778, Lord North intimated to the house of commons, that a paper had been laid before the king by the French ambassador, intimating the conclusion of an alliance between the court of France and the United States of America. The preliminaries of this treaty had been concluded in the end of the year 1777, and a copy of them sent to congress, in order to counteract any proposals that might be made in the mean time by the British ministry. On the 6th of February 1778, the articles were formally signed, to the great satisfaction of the French nation. They were in substance as follows:

1. If Great-Britain should, in consequence of this treaty, proceed to hostilities against France, the two nations should mutually assist one another.

2. The main end of the treaty was, in an effectual manner to maintain the independency of America.

3. Should those places of North-America still subject to Britain be reduced by the colonies, they should be confederated with them, or subjected to their jurisdiction.

4. Should any of the West India islands be reduced by France, they should be deemed its property.

5. No formal treaty with Great Britain should be concluded either by France or America without the consent of each other; and it was mutually engaged that

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that they ſhould not lay down their arms till the independency of the States had been formally acknowledged.

6. The contracting parties mutually agreed to invite thoſe powers that had received injuries from Great Britain to join the common cauſe.

7. The United States guaranteed to France all the poſſeſſions in the Weſt Indies which ſhe ſhould conquer; and France in her turn guaranteed the abſolute independency of the States, and their ſupreme authority over every country they poſſeſſed, or might acquire during the war.

298
Debates occaſioned by the treaty.

The notification of ſuch a treaty as this could not but be looked upon as a declaration of war. On its being announced to the houſe, every one agreed in an addreſs to his majeſty, promiſing to ſtand by him to the utmoſt in the preſent emergency; but it was warmly contended by the members in oppoſition, that the preſent miniſtry ought to be removed on account of their numberleſs blunders and miſcarriages in every inſtance. Many were of opinion, that the only way to extricate the nation from its trouble was to acknowledge the independency of America at once; and thus they might ſtill do with a good grace what muſt inevitably be done at laſt, after expending much more blood and treaſure than had yet been laviſhed in this unhappy conteſt. The miniſterial party, however, entertained different ideas. Inſtigated by zeal for the national honour, it was determined at once to reſent the arrogance of France, and proſecute hoſtilities againſt America with more vigour than ever, ſhould the terms now offered them be rejected.

299
Americans ſend agents to different courts.

The Americans in the mean time aſſiduouſly employed their agents at the courts of Spain, Vienna, Pruſſia, and Tuſcany, in order, if poſſible, to conclude alliances with them, or at leaſt to procure an acknowledgment of their independency. As it had been reported that Britain intended to apply for aſſiſtance to Ruſſia, the American commiſſioners were enjoined to uſe their utmoſt influence with the German princes to prevent ſuch auxiliaries from marching through their territories, and to endeavour to procure the recal of the German troops already ſent to America. To France they offered a ceſſion of ſuch Weſt India iſlands as ſhould be taken by the united ſtrength of France and America; and ſhould Britain by their joint endeavours be diſpoſſeſſed of Newfoundland, Cape Breton, and Nova Scotia, thoſe territories ſhould be divided betwixt the two nations, and Great Britain be totally excluded from the fiſhery. The propoſals to the Spaniſh court were, that in caſe they ſhould think proper to eſpouſe their quarrel, the American ſtates ſhould aſſiſt in reducing Penſacola under the dominion of Spain, provided their ſubjects were allowed the free navigation of the river Miſſiſſippi and the uſe of the harbour of Penſacola; and they further offered, that, if agreeable to Spain, they would declare war againſt Portugal, ſhould that power expel the American ſhips from its ports.

300
General Burgoyne's troops detained in America.

In the mean time the troops under General Burgoyne were preparing to embark for Britain according to the convention at Saratoga; but congreſs having received information, that many articles of ammunition and accoutrements had not been ſurrendered agreeably to the ſtipulated terms, and finding ſome cauſe to apprehend, that ſiniſter deſigns were harboured on the part of Great Britain to convey theſe troops to join the army at Philadelphia or New-York, poſitively refuſed to let them embark, until an explicit ratification of the convention ſhould be properly notified by the Britiſh court.

The ſeaſon for action was now approaching; and congreſs was indefatigable in its preparations for a new campaign, which it was confidently ſaid would be the laſt. Among other methods taken for this purpoſe, it was recommended to all the young gentlemen of the colonies to form themſelves into bodies of cavalry to ſerve at their own expence during the war. General Waſhington at the ſame time, to remove all incumbrances from his army, lightened the baggage as much as poſſible, by ſubſtituting ſacks and portmanteaus in place of cheſts and boxes, and uſing pack-horſes inſtead of waggons. On the other hand, the Britiſh army, expecting to be reinforced by 20,000 men, thought of nothing but concluding the war according to their wiſhes before the end of the campaign.

301
Conciliatory bill received with indignation by the army.

It was with the utmoſt concern, as well as indignation, therefore, that they received the news of Lord North's conciliatory bill. It was univerſally looked upon as a national diſgrace; and ſome even tore the cockades from their hats, and trampled them under their feet as a token of their indignation.

302
Deſpiſed by the coloniſts.

By the coloniſts it was received with indifference. The Britiſh commiſſioners endeavoured to make it as public as poſſible; and the congreſs, as formerly, ordered it to be printed in all the newſpapers. On this occaſion Governor Tryon incloſed ſeveral copies of the bill to General Waſhington in a letter, intreating that he would allow them to be circulated; to which the General returned for anſwer a copy of a newſpaper in which the bill was printed, with the reſolutions of congreſs upon it. Theſe were, That whoever preſumed to make a ſeparate agreement with Britain ſhould be deemed a public enemy; that the United States could not with any propriety keep correſpondence with the commiſſioners until their independence was acknowledged, and the Britiſh fleets and armies removed from America. At the ſame time, the colonies were warned not to ſuffer themſelves to be deceived into ſecurity by any offers that might be made; but to uſe their utmoſt endeavours to ſend their quotas with all diligence into the field. The individuals with whom the commiſſioners converſed on the ſubject of the conciliatory bill, generally returned for anſwer, that the day of reconciliation was paſt; and that the haughtineſs of Britain had extinguiſhed all filial regard in the breaſts of Amecans.

About this time alſo Mr Silas Dean arrived from France with two copies of the treaty of commerce and alliance to be ſigned by congreſs. Advices of the moſt agreeable nature were alſo received from various parts, repreſenting in the moſt favourable light the diſpoſitions of the European powers; all of whom, it was ſaid, wiſhed to ſee the independence of America ſettled upon the moſt permanent baſis.

303
Bad ſucceſs of the commiſſioners.

Conſidering the ſituation of matters with the coloniſts at this time, therefore, it was no wonder the commiſſioners found themſelves unable to accompliſh the errand on which they came. Their propoſals were utterly rejected, themſelves treated as ſpies, and, after a vain attempt

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by governor Johnstone, one of the commissioners, to bribe several members of congress, all intercourse with them was interdicted.

304 Philadelphia evacuated.

But before any final answer could be obtained from congress, Sir Henry Clinton had taken the resolution of evacuating Philadelphia. Accordingly, on the 10th of June, after having made all necessary preparations, the army marched out of the city and crossed the Delaware before noon with all its baggage and other incumbrances. General Washington, apprised of this design, had dispatched expresses into the Jerseys with orders to collect all the force that could be assembled in order to obstruct the march of the enemy. After various movements on both sides, Sir Henry Clinton, with the royal army, arrived on the 27th of June at a place called Freehold; where, judging that the enemy would attack him, he encamped in a very strong situation. Here General Washington determined to make an attack as soon as the army had again begun its march. The night was spent in making the necessary preparations, and General Lee with his division was ordered to be ready by day-break. But Sir Henry Clinton, apprehending that the chief object of the Americans was the baggage, committed it to the care of General Knyphausen, whom he ordered to set out early in the morning, while he followed with the rest of the army. The attack was accordingly made; but the British general had taken such care to arrange his troops properly, and so effectually supported his forces when engaged with the Americans, that the latter not only made no impression, but were with difficulty preserved from a total defeat by the advance of General Washington with the whole army. The British troops effected their retreat in the night with the loss of 300 men, of whom many died through mere fatigue, without any wound. In this action General Lee was charged by General Washington with disobedience and misconduct in retreating before the British army. He was tried by a court-martial, and sentenced to a temporary suspension from his command. After they had arrived at Sandy-Hook, a bridge of boats was by Lord Howe's directions thrown from thence over the channel which separated the island from the main land, and the troops were conveyed aboard the fleet; after which they sailed to New-York.

After sending some light detachments to watch the enemy's motions, General Washington marched towards the North-River, where a great force had been collected to join him, and where it was now expected that some very capital operations would take place.

In the mean time France had set about her preparations for the assistance of the Americans. On the 14th of April Count d'Estaing had sailed from Toulon

305 French fleet arrives in America.

with a strong squadron of ships of the line and frigates, and arrived on the coast of Virginia in the beginning of July, whilst the British fleet was employed in conveying the forces from Sandy-hook to New-York. It consisted of one ship of 90 guns, one of 80, six of 74, and four of 64, besides several large frigates; and, exclusive of its complement of sailors, had 6000 marines and soldiers on board. To oppose this the British had only six ships of 64 guns, three of 50, and two of 40, with some frigates and sloops. Notwithstanding this inferiority, however, the British admiral posted himself so advantageously, and showed such superior skill, that d'Estaing did not think proper to attack him; particularly, as the pilots informed him that it was impracticable to carry his large ships over the bar into the hook, and General Washington pressed him to sail for Newport. He therefore remained at anchor four miles off Sandy-hook till the 22d of July, without effecting any thing more than the capture of some vessels, which, through ignorance of his arrival, fell into his hands.

306 Attempts Rhode-Island without success.

The next attempt of the French admiral was, in conjunction with the Americans, on Rhode-Island. It was proposed that d'Estaing, with the 6000 troops he had with him, should make a descent on the southern part of the island, while a body of the Americans should take possession of the north; at the same time the French squadron was to enter the harbour of Newport, and take and destroy all the British shipping. On the 8th of August the French admiral entered the harbour as was proposed, but found himself unable to do any material damage. Lord Howe, however, instantly set sail for Rhode-Island; and d'Estaing, confiding in his superiority, immediately came out of the harbour to attack him. A violent storm parted the two fleets, and did so much damage that they were rendered totally unfit for action. The French, however, suffered most; and several of their ships being afterwards attacked singly by the British, very narrowly escaped being taken. On the 20th of August he returned to Newport in a very shattered condition; and, not thinking himself safe there, sailed two days after for Boston. General Sullivan had landed in the mean time on the northern part of Rhode-Island with 10,000 men. On the 17th of August they began their operations by erecting batteries, and making their approaches to the British lines. But General Pigot, who commanded in Newport, had taken such effectual care to secure himself on the land-side, that without the assistance of a marine force it was altogether impossible to attack him with any probability of success. The conduct of d'Estaing, therefore, who had abandoned them when master of the harbour, gave the greatest disgust to the people of New-England, and Sullivan began to think of a retreat. On perceiving his intentions, the garrison sallied out upon him with so much vigour, that it was not without difficulty that he effected his retreat. He had not been long gone when Sir Henry Clinton arrived with a body of 4000 men; which, had it arrived sooner, would have enabled the British commander to have gained a decisive advantage over him, as well as to have destroyed the town of Providence, which, by its vicinity to Rhode-Island, and the enterprises which were continually projected and carried on in that place, kept the inhabitants of Rhode-Island in continual alarms.

307 The coasts of America invaded by the British fleet.

The first British expedition was to Buzzard's-Bay, on the coast of New-England and neighbourhood of Rhode-Island. Here they destroyed a great number of privateers and merchantmen, magazines, with store-houses, &c.; whence proceeding to a fertile and populous island, called Martha's-Vineyard, they carried off 2000 sheep and 300 black cattle. Another expedition took place up the North-River, under Lord Cornwallis and General Knyphausen; the principal event of which was, the destruction of a regiment of American cavalry known by the name of Washington's

America. ton's Light Horse. A third expedition was directed to Little Egg-Harbour in New-Jersey, a place noted for privateers, the destruction of which was its principal intention. It was conducted by Captains Ferguson and Collins, and ended in the destruction of the American vessels, as well as of the place itself. At the same time part of another body of American troops, called Pulaski's legion, was surprised, and a great number of them put to the sword.

308 Expedition against Georgia.

The Americans had in the beginning of the year projected the conquest of West-Florida; and one Captain Willing, with a party of resolute men, had made a successful incursion into the country. This awakened the attention of the British to the southern colonies, and an expedition against them was resolved on. Georgia was the place of destination; and the more effectually to ensure success, Colonel Campbell, with a sufficient force, under convoy of some ships of war, commanded by Commodore Hyde Parker, embarked at New-York; while General Provost, who commanded in East-Florida, was directed to set out with all the force he could spare. The armament from New-York arrived off the coast of Georgia in the month of December; and though the Americans were very strongly posted in an advantageous situation on the shore, the British troops made good their landing, and advanced towards Savannah the capital of the province. That very day they defeated the force of the provincials which opposed them; and took possession of the town with such celerity, that the Americans had not time to execute a resolution they had taken of setting it on fire.

309 Take possession of Georgia.

In ten days the whole province of Georgia was reduced, Sunbury alone excepted; and this was also brought under subjection by General Prevost in his march northward. Every proper method was taken to secure the tranquillity of the country; and rewards were offered for apprehending committee and assembly men, or such as they judged most inimical to the British interests. On the arrival of General Prevost, the command of the troops naturally devolved on him as the senior officer; and the conquest of Carolina was next projected.

310 Carolina invaded.

In this attempt there was no small probability of success. The country contained a great number of friends to government, who now eagerly embraced the opportunity of declaring themselves; many of the inhabitants of Georgia had joined the royal standard; and there was not in the province any considerable body of provincial forces capable of opposing the efforts of regular and well-disciplined troops. On the first news of General Prevost's approach, the loyalists assembled in a body, imagining themselves able to stand their ground until their allies should arrive; but in this they were disappointed. The Americans attacked and defeated them with the loss of half their number. The remainder retreated into Georgia; and after undergoing many difficulties, at last effected a junction with the British forces.

In the mean time, General Lincoln, with a considerable body of American troops, had encamped within 20 miles of the town of Savannah; and another strong party had posted themselves at a place called *Briar's Creek*, farther up the river of the same name. Thus the extent of the British government was likely to be circumscribed within very narrow bounds. General Prevost therefore determined to dislodge the party at Briar's Creek: and the latter, trusting to their strong situation, and being remiss in their guard, suffered themselves to be surprised on the 30th of March 1779; when they were utterly routed with the loss of more than 300 killed and taken, besides a great number drowned in the river or the swamps. The whole artillery, stores, baggage, and almost all the arms of this unfortunate party were taken, so that they could no more make any stand; and thus the province of Georgia was once more freed from the Americans, and a communication opened with those places in Carolina where the royalists chiefly resided.

311 Americans defeated

The victory at Briar's Creek proved of considerable service to the British cause. Great numbers of the loyalists joined the army, and considerably increased its force. Hence he was enabled to stretch his posts further up the river, and to guard all the principal passes: so that General Lincoln was reduced to a state of inaction; and at last moved off towards Augusta, in order to protect the provincial assembly, which was obliged to sit in that place, the capital being now in the hands of the British.

Lincoln had no sooner quitted his post, than it was judged a proper time by the British general to put in execution the grand scheme which had been meditated against Carolina. Many difficulties indeed lay in his way. The river Savannah was so swelled by the excessive rains of the season, that it seemed impassable; the opposite shore, for a great way, was so full of swamps and marshes, that no army could march over it without the greatest difficulty; and, to render the passage still more difficult, General Moultrie was left with a considerable body of troops in order to oppose the enemy's attempts. But in spite of every opposition, the constancy and perseverance of the British troops at last prevailed. General Moultrie was obliged to retire towards Charleston; and the pursuing army, after having waded through the marshes for some time, at last arrived in an open country, through which they pursued their march with great rapidity, towards the capital; while General Lincoln made preparations to march to its relief.

312 The British troops advance to Charleston.

Certain intelligence of the danger to which Charleston was exposed, animated the American general A chosen body of infantry, mounted on horseback for the greater expedition, was dispatched before him; while Lincoln himself followed with all the forces he could collect. General Moultrie too, with the troops he had brought from Savannah, and some others he had collected since his retreat from thence, had taken possession of all the avenues leading to Charleston, and prepared for a vigorous defence. But all opposition proved ineffectual; and the British army was allowed to come within cannon shot of Charleston on the 12th of May.

313 General Lincoln advances to its relief.

The town was now summoned to surrender, and the inhabitants would gladly have agreed to observe a neutrality during the rest of the war, and would have engaged also for the rest of the province. But these terms not being accepted, they made preparations for a vigorous defence. It was not, however, in the power of the British commander at this time to make an attack with any prospect of success. His artillery was not of sufficient weight; there were no ships to support

314 The attempt on it abandoned.

port his attack by land; and General Lincoln advancing rapidly with a superior army, threatened to inclose him between his own force and the town; so that should he fail in his first attempt, certain destruction would be the consequence. For these reasons he withdrew his forces from before the town, and took possession of two islands, called *St James's* and *St John's*, lying to the southward; where having waited some time, his force was augmented by the arrival of two frigates. With these he determined to make himself master of Port-Royal, another island possessed of an excellent harbour, and many other natural advantages, from its situation also commanding all the sea-coast from Charleston to Savannah River. The American general, however, did not allow this to be accomplished without opposition. Perceiving that his opponent had occupied an advantageous post on St John's island preparatory to his enterprise against Port-Royal, he attempted, on the 20th of June, to dislodge them from it; but, after an obstinate attack, the provincials were obliged to retire with considerable loss. On this occasion the success of the British arms was in a great measure owing to an armed float, which galled the right flank of the enemy so effectually, that they could direct their efforts only against the strongest part of the lines, which proved impregnable to their attacks. This disappointment was instantly followed by the loss of Port-Royal, which General Prevost took possession of, and put his troops into proper stations, waiting for the arrival of such reinforcements as were necessary for the intended attack on Charleston.

315
The Americans defeated.

The profligate conduct of the refugees, and the officers and soldiers of the British, in plundering the houses of individuals, during their incursion, is incredible. Negroes were seduced or forced from their masters; furniture and plate were seized without decency or authority; and the most infamous violations of every law of honour and honesty were openly perpetrated. Individuals thus accumulated wealth, but the reputation of the British arms incurred an everlasting stigma.

316
D'Estaing's proclamation.

In the mean time Count d'Estring, who, as we have already observed, had put into Boston harbour to refit, had used his utmost efforts to ingratiate himself with the inhabitants of that city. Zealous also in the cause of his master, he had published a proclamation to be dispersed through Canada, inviting the people to return to their original friendship with France, and declaring that all who renounced their allegiance to Great Britain should certainly find a protector in the king of France. All his endeavours, however, proved insufficient at this time to produce any revolution, or ever to form a party of any consequence among the Canadians.

317
D'Estaing fails to the West Indies

As soon as the French admiral had refitted his fleet, he took the opportunity, while that of Admiral Byron had been shattered by a storm, of sailing to the West-Indies. During his operations there, the Americans having represented his conduct as totally unserviceable to them, he received orders from Europe to assist the colonies with all possible speed.

318
D'Estaing's expedition against Georgia.

In compliance with these orders, he directed his course towards Georgia, with a design to recover that province out of the hands of the enemy, and to put it, as well as South Carolina, in such a posture of defence as would effectually secure them from any future attack. This seemed to be an easy matter, from the little force with which he knew he should be opposed; and the next object in contemplation was no less than the destruction of the British fleet and army at New-York, and their total expulsion from the continent of America. Full of these hopes, the French commander arrived off the coast of Georgia with a fleet of 22 sail of the line and 10 large frigates. His arrival was so little expected, that several vessels laden with provisions and military stores fell into his hands; the Experiment also, a vessel of 50 guns, commanded by Sir James Wallace, was taken after a stout resistance. On the continent, the British troops were divided. General Prevost, with an inconsiderable part, remained at Savannah; but the main force was under Colonel Maitland at Port Royal. On the first appearance of the French fleet, an express was dispatched to Colonel Maitland: but it was intercepted by the Americans; so that before he could set out in order to join the commander in chief, the Americans had secured most of the passes by land, while the French fleet effectually blocked up the passage by sea. But, by taking advantage of creeks and inlets, and marching over land, he arrived just in time to relieve Savannah.

319
Conduct of the French commander.

D'Estaing had allowed General Prevost 24 hours to deliberate whether he should capitulate or not. This time the general employed in making the best preparations he could for a defence; and during this time it was that Colonel Maitland arrived. D'Estaing's summons was now rejected. The garrison now consisted of 3000 men, all of approved valour and experience, while the united force of the French and Americans did not amount to 10,000. The event was answerable to the expectations of the British general. Having the advantage of a strong fortification and excellent engineers, the fire of the allies made so little impression that D'Estaing resolved to bombard the town, and a battery of nine mortars was erected for the purpose. This produced a request from General Prevost, that the women and children might be allowed to retire to a place of safety. But the allied commanders, from motives of policy, refused compliance; and they resolved to give a general assault. This was accordingly attempted on the 9th of October: but the assailants were every where repulsed with such slaughter, that 1200 were killed and wounded; among the former were Count Pulaski, the celebrated conspirator against the reigning king of Poland, and among the latter was D'Estaing himself.

320
The French and the American generals refuse to permit the women to withdraw.

321
They are defeated.

This disaster entirely overthrew the sanguine hopes of the Americans and French; but so far from reproaches or animosity arising between them, their common misfortune seemed to increase their confidence and esteem for each other; a circumstance fairly to be ascribed to the conciliatory conduct of General Lincoln upon every occasion. After waiting eight days longer, both parties prepared for a retreat; the French to their shipping, and the Americans into Carolina.

322
Successful expeditions against the northern provinces.

While the allies were thus unsuccessfully employed in the southern colonies, their antagonists were no less assiduous in distressing them in the northern parts. Sir George Collier was sent with a fleet, carrying on board General Matthews, with a body of land forces, into the

America. the province of Virginia. Their first attempt was on the town of Portsmouth; where though the Americans had destroyed some ships of great value, the British troops arrived in time to save a great number of others. On this occasion about 120 vessels of different sizes were burnt, and 20 carried off; and an immense quantity of provisions designed for the use of General Washington's army was either destroyed or carried off, together with a great variety of naval and military stores. The fleet and army returned with little or no loss to New-York.

The success with which this expedition was attended, soon gave encouragement to attempt another. The Americans had for some time been employed in the erection of two strong forts on the river; the one at Verplanks Neck on the east, and the other at Stoney Point on the west side. These when completed would have been of the utmost service to the Americans, as commanding the principal pass, called the *King's Ferry*, between the northern and southern colonies. At present, however, they were not in a condition to make any effectual defence; and it was therefore determined to attack them before the works should be completed. The force employed on this occasion was divided into two bodies; one of which directed its course against Verplanks, and the other against Stoney Point. The former was commanded by general Vaughan, the latter by General Patterson, while the shipping was under the direction of Sir George Collier. General Vaughan met with no resistance, the Americans abandoning their works, and setting fire to every thing combustible that they could not carry off. At Stoney Point, however, a vigorous defence was made, though the garrison was at last obliged to capitulate upon honourable conditions. To secure the possession of this last, which was the more important of the two, General Clinton removed from his former situation, and encamped in such a manner that General Washington could not give any assistance. The Americans, however revenged themselves by distressing, with their numerous privateers, the trade to New-York.

This occasioned a third expedition to Connecticut, where these privateers were chiefly built and harboured. The command was given to Governor Tryon and to General Garth, an officer of known valour and experience. Under convoy of a considerable number of armed vessels they landed at Newhaven, where they demolished the batteries that had been erected to oppose them, and destroyed the shipping and naval stores but they spared the town itself, as the inhabitants had abstained from firing out of their houses upon the troops. From Newhaven they marched to Fairfield, where they proceeded as before, reducing the town also to ashes. Norwalk was next attacked, which in like manner was reduced to ashes; as was also Greenfield, a small seaport in the neighbourhood. Such repeated conflagrations, wantonly and cruelly spread, served only to increase the disgust which was felt by every friend to the American cause.

These successes proved very alarming as well as detrimental to the Americans; so that General Washington determined at all events to drive the enemy from Stoney Point. For this purpose he sent Gen. Wayne with a detachment of chosen men, directing him to attempt the recovery of it by surprise. On this occasion the Americans showd a spirit and resolution exceeding any thing either party had performed during the course of the war. Though after the capture of it by the British the fortifications of this place had been completed, and were very strong, they attacked the enemy with bayonets, after passing through a heavy fire of musquetry and grape shot; and, in spite of all opposition, obliged the surviving part of the garrison, amounting to 500 men, to surrender themselves prisoners of war.

Though the Americans did not at present attempt to retain possession of Stoney Point, the success they had met with in the enterprise emboldened them to make a similar attempt on Paulus Hook, a fortified post on the Jersey side, opposite to New-York; but, although the heroism of the interprise and the spirit with which it was executed deserves applause, after having completely surprised the posts, the American commander, Major Lee, finding it impossible to retain them, made an orderly retreat, with about 161 prisoners, among whom were seven officers.

323 Unsuccessful expedition of the Americans against Penobscot.

Another expedition of greater importance was now projected on the part of the Americans. This was against a post on the river Penobscot, on the borders of Nova Scotia, of which the British had lately taken possession, and where they had begun to erect a fort which threatened to be a very great inconvenience to the colonists. The armament destined against it was so soon got in readiness, that Colonel Maclane, the commanding officer at Penobscot, found himself obliged to drop the execution of part of his scheme; and instead of a regular fort, to content himself with putting the works already constructed in as good a posture of defence as possible. The Americans could not effect a landing without a great deal of difficulty, and bringing the guns of their largest vessels to bear upon the shore. As soon as this was done, however, they erected several batteries, and kept up a brisk fire for the space of a fortnight; after which they proposed to give a general assault: but before this could be effected, they perceived Sir George Collier with a British fleet sailing up the river to attack them. On this they instantly embarked their artillery and military stores, sailing up the river as far as possible in order to avoid him. They were so closely pursued, however, that not a single vessel could escape, so that the whole fleet, consisted of 19 armed vessels and 24 transports, was destroyed; most of them indeed being blown up by themselves. The soldiers and sailors were obliged to wander through immense desarts, where they suffered much for want of provisions; and to add to their calamities, a quarrel broke out between the soldiers and seamen concerning the cause of their disaster, which ended in a violent fray, wherein a great number were killed.

324 Indians and refugees attack the back settlements of Pennsylvania.

To add to the distress of the Americans, the Indians, accompanied by a number of refugees, attacked the back settlements of Pennsylvania. No effectual measures being taken to repress the hostile spirit of the Indians, numbers joined the tory refugees, and with these commenced their horrid depredations and hostilities upon the back settlers, being headed by col. Butler and Brandt, an half blooded Indian, of desperate courage, ferocious and cruel beyond example. Their expeditions were carried on to great advantage, by the exact knowledge which the refugees possessed of

America. of every object of their interprise, and the immediate intelligence they received from their friends on the spot. The weight of their hostilities fell upon the fine, new and flourishing settlement of Wyoming, situated on the eastern branch of the Susquehanna, in a most beautiful country and delightful climate. It was settled and cultivated with great ardor by a number of people from Connecticut, which claimed the territory as included in its original grant from Charles II. The settlement consisted of eight townships, each five miles square, beautifully placed on each side of the river. It had increased so by a rapid population, that they sent a thousand men to serve in the continental army. To provide against the dangers of their remote situation. Four forts were constructed to cover them from the irruptions of the Indians.—But it was their unhappiness, to have a considerable mixture of royalists among them; and the two parties were actuated by sentiments of the most violent animosity which was not confined to particular families or places: but creeping within the roofs and to the hearths and floors where it was least to be expected, served equally to poison the sources of domestic security and happiness, and to cancel the laws of nature and humanity.

They had frequent and timely warnings of the danger to which they were exposed by sending their best men to so great a distance. Their quiet had been interrupted by the Indians, joined by marauding parties of their own countrymen, in the preceding year; and it was only by a vigorous opposition, in a course of successful skirmishes, that they had been driven off. Several tories, and others not before suspected, had then and since abandoned the settlement: and beside a perfect knowledge of all their particular circumstances, carried along with them such a stock of private resentment, as could not fail of directing the fury, and even giving an edge to the cruelty of their Indian and other inveterate enemies. An unusual number of strangers had come among them under various pretences, whose behaviour became so suspicious, that upon being taken up and examined, such evidence appeared against several of them, of their acting in concert with the enemy, on a scheme for the destruction of the settlements, that about twenty were sent off to Connecticut to be there imprisoned and tried for their lives, while the remainder were expelled. These measures excited the rage of the tories in general to the most extreme degree; and the threats formerly denounced against the settlers, were now renewed with aggravated vengeance.

325 Treachery of the Indians.

As the time approached for the final catastrophe, the Indians practised unusual treachery. For several weeks previous to the intended attack, they repeatedly sent small parties to the settlement, charged with the strongest professions of friendship. These parties, beside attempting to lull the people into security, answered the purposes of communicating with their friends, and of observing the present state of affairs. The settlers, however, were not insensible to the danger. They had taken the alarm, and col. Zebulon Butler had several times written letters to congress and gen. Washington, acquainting them with the danger the settlement was in, and requesting assistance; but the letters were never received, having been intercepted by the Pennsylvania tories. A little before the main attack, some small parties made sudden irruptions, and committed several robberies and murders; and from ignorance or a contempt of all ties whatever, massacred the wife and five children of one of the persons sent for trial to Connecticut in their own cause.

326 Col. John Butler appears with all his forces on the Susquehanna.

At length, in the beginning of July, the enemy suddenly appeared in full force on the Susquehanna, headed by col. John Butler, a Connecticut tory, and cousin to col. Zeb. Butler, the second in command in the settlement. He was assisted by most of those leaders, who had rendered themselves terrible in the present frontier war. Their force was about 1600 men, near a fourth Indians, led by their own chiefs; the others were so disguised and painted as not to be distinguished from the Indians, excepting their officers, who being dressed in regimentals, carried the appearance of regulars. One of the smaller forts, garrisoned chiefly by tories, was given up or rather betrayed. Another was taken by storm, and all but the women and children massacred in the most inhuman manner.

427 Col. Zeb. Butler enticed to hold a conference with his cousin, and betrayed.

Colonel Zeb. Butler, leaving a small number to guard fort Wilkesborough, crossed the river with about 400 men, and marched into Kingston fort, whither the women, children and defenceless of all sorts crowded for protection. He suffered himself to be enticed by his cousin to abandon the fortress. He agreed to march out, and hold a conference with the enemy in the open field (at so great a distance from the fort, as to shut out all possibility of protection from it) upon their withdrawing according to their own proposal, in order to the holding of a parley for the conclusion of a treaty. He at the same time marched out about 400 men well armed, being nearly the whole strength of the garrison, to guard his person to the place of parley, such was his distruct of the enemy's designs. On his arrival he found no body to treat with him, and yet advanced toward the foot of the mountain, where at a distance he saw a flag, the holders of which, seemingly afraid of treachery on his side, retired as he advanced; whilst he, endeavouring to remove this pretended ill-impression, pursued the flag, till his party was thoroughly enclosed, when he was suddenly freed from his delusion, by finding it attacked at once on every side. He and his men, notwithstanding the surprise and danger, fought with resolution and bravery, and kept up so continual and heavy a fire for three quarters of an hour, that they seemed to gain a marked superiority. In this critical moment, a soldier, through a sudden impulse of fear, or premeditated treachery, cried out aloud, "the colonel has ordered a retreat." The fate of the party was now at once determined. In the state of confusion that ensued, an unresisted slaughter commenced, while the enemy broke in on all sides without obstruction. Col. Zeb. Butler, and about seventy of his men escaped; the latter got across the river to fort Wilkesborough, the colonel made his way to fort Kingston;

328 Fort Kingston invested by the enemy.

which was invested the next day on the land side. —The enemy, to sadden the drooping spirits of the weak remaining garrison, sent in for their contemplation the bloody scalps of one hundred and ninety-six of their late friends and comrades.—They kept up up a continual fire upon the fort the whole day. In the evening the colonel quitted the fort and went down the river with his family. He is thought to be the only officer that escaped.

329 Distressed situation of the garrisons.

Colonel Nathan Dennison, who succeeded to the command, seeing the impossibility of an effectual defence, went out with a flag to col. John Butler, to know what terms he would grant on a surrender; to which application Butler answered with more than savage phlegm in two short words—*the hatchet.*——Dennison having defended the fort, till most of the garrison were killed or disabled was compelled to surrender at discretion. Some of the unhappy persons in the fort were carried away alive; but the barbarous conquerors, to save the trouble of murder in detail, shut up the rest promiscuously in the houses and barracks; which having set on fire, they enjoyed the savage pleasure of beholding the whole consumed in one general blaze.

They then crossed the river to the only remaining fort, Wilkesborough, which in hopes of mercy surrendered without demanding any conditions. They found about seventy continental soldiers, who had been engaged merely for the defence of the frontiers, whom they butchered with every circumstance of horrid cruelty. The remainder of the men, with the women and children, were shut up as before in the houses, which being set on fire, they perished altogether in the flames.

A general scene of devastation was now spread through all the townships. Fire, sword, and the other different instruments of destruction alternately triumphed. The settlements of the tories alone generally escaped, and appeared as islands in the midst of the surrounding ruin. The merciless ravagers having destroyed the main objects of their cruelty, directed their animosity to every part of living nature belonging to them; shot and destroyed some of their cattle, and cut out the tongues of others, leaving them still alive to prolong their agonies.

Thus the arms of America and France being almost every where unsuccessful, the independency of the former seemed yet to be in danger, notwithstanding the

330 Spain joins the confederacy against Britain.

assistance of so powerful an ally, when further encouragement was given by the accession of Spain to the confederacy against Britain in the month of June 1779. The first effect of this appeared in an invasion of West Florida by the Spaniards in September 1779. As the country was in no state of defence, the enemy easily made themselves masters of the whole, almost without opposition. Their next enterprise, was against the Bay of Honduras, where the British logwood-cutters were settled. These finding themselves too weak to resist, applied to the governor of Jamaica for relief, who sent them a supply of men, ammunition, and military stores, under Captain Dalrymple. Before the arrival of this detachment, the principal settlement in those parts, called *St George's Key*, had been taken by the Spaniards and retaken by the British. In his way Captain Dalrymple fell in with a squadron from Admiral Parker in search of some register ships richly laden; but which, retreating into the harbour of Omoa, were too strongly protected by the fort to be attacked with safety. A project was then formed, in conjunction with the people of Honduras, to reduce this fort. The design was to surprise it; but the Spaniards having discovered them, they were obliged to fight. Victory quickly declared for the British; but the fortifications were so strong, that the artillery they had brought along with them were found too light to make any impression. It was then determined to try the success of an escalade; and this was executed with so much spirit, that the Spaniards stood astonished without making any resistance, and, in spite of all the efforts of the officers, threw down their arms and surrendered. The spoil was immense, being valued at three millions of dollars. The Spaniards chiefly lamented the loss of 250 quintals of quicksilver; a commodity indispensably necessary in the working of their gold and silver mines, so that they offered to ransom it at any price; but this was refused, as well as the ransom of the fort, though the governor offered 300,000 dollars for it. A small garrison was left for the defence of the place: but it was quickly attacked by a superior force, and obliged to evacuate it, though not without destroying every thing that could be of use to the enemy; spiking the guns, and even locking the gates of the fort and carrying off the keys. All this was done in sight of the besiegers; after which the garrison embarked without the loss of a man.

331 Fort Omoa taken by the British.

332 But are obliged to evacuate it.

333 Americans take vengeance on the Indians.

As no operations of any consequence took place this year in the province of New-York, the congress made use of the opportunity to dispatch General Sullivan with a considerable force, in order to take vengeance on the Indians for their ravages and depredations. Of this the Indians were apprised; and collecting all their strength, resolved to come to a decisive engagement. Accordingly they took a strong post in the most woody and mountanious part of the country; erecting a breast-work in their front, of large logs of wood extending half a mile in length, while their right flank was covered by a river, and the left by a hill of difficult access. This advantageous position they had taken by the advice of the refugees who were among them, and of whom 200 or 300 were present in the battle.

Thus posted, the Indians waited the approach of the American army: but the latter having brought some artillery along with them, played it against the breast-work of the enemy with such success, that in two hours it was almost destroyed; and at the same time a party having reached the top of the hill, they became apprehensive of being surrounded, on which they instantly fled with precipitation, leaving a great number of killed and wounded behind them. The Americans after this battle met with no further resistance of any consequence. They were suffered to proceed without interruption. On entering the country of the Indians, it appeared that they had been acquainted with agriculture and the arts of peace far beyond what had been supposed. From General Sullivan's account it was learned, that the Indian houses were large, convenient, and even elegant; their grounds were excellently cultivated, and their gardens abounded in fruit-trees and vegetables of all kinds fit for food. The whole of this fine country would now have been converted into a desart, had it not been for the humane forbearance of General Hand and

and Colonel Durbin. The desolation, however, was extensive, and only to be justified by the savage character and example of their enemy.

We must now take a view of the transactions in the southern colonies; to which the war was, in the year 1780, so effectually transferred, that the operations there became at last decisive. The success of General Prevost in advancing to the very capital of South-Carolina has been already related, together with the obstacles which prevented him from becoming master of

334 Expedition of Sir Henry Clinton against Charleston.

it at that time. Towards the end of the year 1779, however, Sir Henry Clinton set sail from New-York with a considerable body of troops, intended for the attack of Charleston, South-Carolina, in a fleet of ships of war and transports under the command of Vice-admiral Arbuthnot. They had a very tedious voyage; the weather was uncommonly bad; several of the transports were lost, as were also the greater part of the horses which they carried with them, intended for cavalry or other public uses; and an ordnance-ship likewise foundered at sea. Having arrived at Savannah, where they endeavoured to repair the damages sustained on their voyage, they proceeded from thence on the 10th of February, 1780, to North Edisto, the place of debarkation which had been previously appointed. They had a favourable and speedy passage thither: and though it required time to have the bar explored and the channel marked, the transports all entered the harbour the next day; and the army took possession of St John's island, about 30 miles from Charleston, without opposition. Preparations were then made for passing the squadron over Charleston bar, where the high-water spring-tides were only 19 feet deep: but no opportunity offered of going into the harbour till the 20th of March, when it was effected without any accident, though the American galleys continually attempted to prevent the English boats from sounding the channel. The British troops had previously removed from John's to James's island; and on the 29th of the same month they effected their landing on Charleston neck. On the 1st of April they broke ground within 800 yards of the American works; and by the 8th the besiegers guns were mounted in battery.

As soon as the army began to erect their batteries against the town, Admiral Arbuthnot embraced the first favourable opportunity of passing Sullivan's island, upon which there was a strong fort of batteries, the chief defence of the harbour. He weighed on the 9th, with the Roebuck, Richmond, and Romulus, Blonde, Virginia, Raleigh, and Sandwich armed ship, the Renown bringing up the rear; and, passing thro' a severe fire, anchored in about two hours under James's island, with the loss of 27 seamen killed and wounded. The Richmond's fore-top-mast was shot away, and the ships in general sustained damage in their masts and rigging, though not materially in their hulls. But the Acetus transport, having on board some naval stores, grounded within gun-shot of Sullivan's island, and received so much damage that she was obliged to be abandoned and burnt.

335 The town defended by Lincoln.

On the 10th, Sir Henry Clinton (having received a reinforcement of 3000 men from New York) and Admiral Arbuthnot summoned the town to surrender to his majesty's arms: but Major-general Lincoln, who commanded in Charleston, returned them an answer, declaring it to be his intention to defend the place. The batteries were now opened against the town; and from their effect the fire of the American advanced works considerably abated. It appears that the number of troops under the command of Lincoln were by far too few for defending works of such extent as those of Charleston; and that many of these were men little accustomed to military service, and very ill provided with clothes and other necessaries. Lincoln had been for some time expecting reinforcements and supplies from Virginia and other places: but they came in very slowly. Earl Cornwallis, and 336

Several reinforcements intended for his relief intercepted.

Lieutenant-colonel Tarleton under him, were also extremely active in intercepting such reinforcements and supplies as were sent to the American general. They totally defeated a considerable body of cavalry and militia which was proceeding to the relief of the town; and also made themselves masters of some posts which gave them in a great degree the command of the country, by which means great supplies of provisions fell into their hands. Tarleton was himself, however, defeated in a rencounter, with Lieutenant Colonel Washington, at the head of a regular corps of horse.

Such was the state of things, and Fort Sullivan had also been taken by the king's troops, when on the 18th of May General Clinton again summoned the town to surrender; an offer being made, as had been done before, that if they surrendered, the lives and property of the inhabitants should be preserved to them. Articles of capitulation were then proposed by General Lincoln; but the terms were not agreed to by General Clinton. At length, however, the town being closely invested on all sides, and the preparations to storm it in every part being in great forwardness, and 337

the ships ready to move to the assault, General Lincoln, who had been applied to for that purpose by the inhabitants, surrendered it on such articles of capitulation as General Clinton had before agreed to. This was on the 4th of May, which was one month and two days after the town had been first summoned to surrender.

The place surrenders.

A large quantity of ordnance, arms, and ammunition, was found in Charleston; and, according to Sir Henry Clinton's account, the number of prisoners taken in Charleston amounted to 5618 men, exclusive of near a thousand sailors in arms; but according to General Lincoln's account transmitted to the congress, the whole number of continental troops taken prisoners amounted to no more than 197. The remainder, therefore, included in General Clinton's account, consisted of militia and inhabitants of the town. Several American frigates were also taken or destroyed in the harbour of Charleston.

The loss of Charleston evidently excited a considerable alarm in America: and their popular writers, particularly the author of the celebrated performance entitled Common Sense, in some other pieces made use of it as a powerful argument to lead them to more vigorous exertions against Great Britain, that they might the more effectually and certainly secure their independence. 338

Apprehensions at New York.

While Sir Henry Clinton was employed in his voyage to Charleston, and in the siege of that place the

America.

the garrison at New-York seem not to have been wholly free from apprehensions for their own safety. An intense frost, accompanied with great falls of snow, began about the middle of December 1779, and shut up the navigation of the port of New-York from the sea, within a few days after the departure of Admiral Arbuthnot and General Clinton. The severity of the weather increased to so great a degree, that towards the middle of January all communications with New-York by water were entirely cut off, and as many new ones opened by the ice. The inhabitants could scarcely be said to be in an insular state. Horses with heavy carriages could go over the ice into the Jerseys from one island to another. The passage on the North River, even in the widest part from New-York to Paulus Hook, which was 2000 yards, was about the 19th of January practicable for the heaviest cannon: an event which had been unknown in the memory of man. Provisions were soon after transported upon sledges, and a detachment of cavalry marched upon the ice from New-York to Staten-Island, which was a distance of 11 miles.

The city of New-York being thus circumstanced, was considered as much exposed to the attacks from the continental troops: and it was strongly reported that General Washington was meditating a great stroke upon New-York with his whole force, by different attacks. Some time before this, Major-general Pattison, commandant at New-York, having received an address from many of the inhabitants, offering to put themselves in military array, he thought the present a favourable opportunity of trying the sincerity of their professions. Accordingly he is-

339 Forwardness of the inhabitants to be inrolled for its defence.

sued a proclamation, calling upon all the male inhabitants from 16 to 60 to take up arms. The requisition was so readily complied with, that in a few days 40 companies from the six wards of the city were inrolled, officered, and under arms, to the number of 2600, many substantial citizens serving in the ranks of each company. Other volunteer companies were formed, and the city was put into a very strong posture of defence.

340 The provincials attack Staten Island;

No attack, however, was made upon New-York, whatever design might originally have been meditated; but an attempt was made upon Staten-Island, where there were about 1800 men, under the command of Brigadier-general Sterling, who were well intrenched. General Washington, whose army was hutted at Morris-Town, sent a detachment of 2700 men, with six pieces of cannon, two mortars, and some horses, commanded by Lord Sterling, who arrived at Staten-Island early in the morning of the 15th of January. The advanced posts of the British troops retired upon the approach of the Americans,

341 But are induced to make a precipitate retreat.

who formed the line, and made some movements in the course of the day; but they withdrew in the night after having burnt one house, pillaged some others, and carried off with them about 200 head of cattle. Immediately on the arrival of the Americans on Staten-Island, Lieutenant-general Knyphausen had embarked 600 men to attempt a passage, and to support General Sterling: but the floating ice compelled them to return. It is, however, imagined, that the appearance of these transports, with the British troops on board, which the Americans could see towards the close of the day, induced the latter to make so precipitate a retreat.

342 Proclamations by General Clinton.

After Charleston had surrendered to the king's troops, General Clinton issued two proclamations, and also circulated a hand-bill among the inhabitants of South-Carolina, in order to induce them to return to their allegiance, and to be ready to join the king's troops. It was said, that the helping hand of every man was wanted to re-establish peace and good government; and that as the commander in chief wished not to draw the kings friends into danger, while any doubt could remain of their success; so, now, that this was certain, he trusted that one and all would heartily join, and by a general concurrence give effect to such necessary measures for that purpose as from time to time might be pointed out. Those who had families were to form a militia to remain at home, and occasionally to assemble in their own districts, when required, under officers of their own choosing, for the maintenance of peace and good order. Those who had no families, and who could conveniently be spared for a time, it was presumed, would cheerfully assist his majesty's troops in driving their oppressors, acting under the authority of congress, and all the miseries of war, far from that colony. For this purpose it was said to be necessary that the young men should be ready to assemble when required, and to serve with the king's troops for any six months of the ensuing twelve that might be found requisite, under proper regulations. They might choose officers to each company to command them; and were to be allowed, when on service, pay, ammunition, and provisions, in the same manner as the king's troops. When they joined the army, each man was to be furnished with a certificate, declaring that he was only engaged to serve as a militia-man for the time specified; that he was not to be marched beyond North-Carolina and Georgia; and that, when the time was out, he was freed from all claims whatever of military service, excepting the common and usual militia-duty where he lived. He would then, it was said, have paid his debt to his country, and be intitled to enjoy undisturbed that peace, liberty, and property, at home, which he had contributed to secure. The proclamations and publications of General Clinton appear to have produced some effect in South Carolina; though they probably operated chiefly upon those who were before not much inclined to the cause of American independence. Two hundred and ten of the inhabitants of Charleston signed an address to General Clinton and Admiral Arbuthnot, soliciting to be readmitted to the character and condition of British subjects, the inhabitants of that city having been hitherto considered as prisoners on parole; declaring their disapprobation of the doctrine of American independence; and expressing their regret, that after the repeal of those statutes which gave rise to the troubles in America, the overtures made by his majesty's commissioners had not been regarded by the congress. Sir Henry Clinton, in one of the proclamations issued at this time, declared, that if any persons should thenceforward appear in arms in order to prevent the establishment of his majesty's government in that country, or should, under any pretence or authority whatsoever, attempt to compel any other person or persons to do so, or who should hinder or intimidate the king's faithful and loyal subjects from joining his forces or otherwise performing those duties their allegiance required, such persons should be treated with the utmost severity, and their estates be immediately seized in order to be confiscated.

Mean time the ravages of war did not prevent the Americans from paying some attention to the arts of peace. On the 4th of May an act passed by the council and house of representatives of Massachusetts-Bay for incorporating and establishing a society for the cultivation and promotion of the arts and sciences. See ACADEMY, p. 43. col. 2.

343 Proceedings of congress.

Some doubts having arisen in the congress, towards the close of the preceding year, about the propriety of their assembling in the city of Philadelphia, it was now resolved that they should continue to meet there: and a committee of three members was appointed, to report a proper place where buildings might be provided for the reception of the congress, together with an estimate of the expence of providing such buildings, and the necessary offices for the several boards. It was also resolved by the congress, that a monument should be erected to the memory of their late general Richard Montgomery, who fell at Quebec, in testimony of his signal and important services to the United States of America, with an inscription expressive of his amiable character and heroic atchievements; and that the continental treasurers should be directed to advance a sum not exceeding L.300 to Dr Franklin to defray the expence; that gentleman being desired to cause the monument to be executed at Paris, or in some other part of France. It was likewise resolved by the congress, that a court should be established for the trial of all appeals from the court of admiralty of the United States of America, in cases of capture; to consist of three judges, appointed and commissioned by congress, and who were to take an oath of office; and that the trials in this court should be determined by the usage of nations.

344 Difficulties arising from the depreciation of the paper-currency.

The difficulties of the congress and of the people of America had been greatly increased by the depreciation of their paper currency. At the time when the colonies engaged in a war with Great Britain, they had no regular civil governments established among them of sufficient energy to enforce the collection of taxes, or to provide funds for the redemption of such bills of credit as their necessities obliged them to issue. In consequence of this state of things, their bills increased in quantity far beyond the sum necessary for the purpose of a circulating medium: and as they wanted at the same time specific funds to rest on for their redemption, they saw their paper-currency daily sink in value. The depreciation continued, by a kind of gradual progression, from the year 1777 to 1780: so that, at the latter period, the continental dollars were passed, by common consent, in most parts of America, at the rate of at least $\frac{39}{40}$ths below their nominal value. The impossibility of keeping up the credit of the currency to any fixed standard, occasioned great and almost insurmountable embarrassments in ascertaining the value of property, or carrying on trade with any sufficient certainty. Those who sold, and those who bought, were left without a rule whereon to form a judgment of their profit or their loss; and every species of commerce or exchange, whether foreign or domestic, was exposed to numberless and increasing difficulties. The consequences of the depreciation of the paper-currency were also felt with peculiar severity by such of the Americans as were engaged in their military services, and greatly augmented their other hardships. The requisitions made by the congress to the several colonies for supplies, were also far from being always regularly complied with: and their troops were not unfrequently in want of the most common necessaries; which naturally occasioned complaints and discontent among them. Such difficulties, resulted from their circumstances and situation, as perhaps no wisdom could have prevented. The cause of the Americans appears also to have suffered somewhat by their depending too much on temporary enlistments. But the congress endeavoured, towards the close of the year 1780, to put their army upon a more permanent footing, and to give all the satisfaction to their officers and soldiers which their circumstances would permit. They appointed a committee for arranging their finances, and made some new regulations respecting the war-office and treasury-board, and other public departments.

545 Anniversary of American independence celebrated at Philadelphia.

Notwithstanding the disadvantages under which they laboured, the Americans seemed to entertain no doubts but that they should be able to maintain their independency. The 4th of July was celebrated this year at Philadelphia with some pomp, as the anniversary of American independence. A commencement for conferring degrees in the arts was held the same day, in the hall of the university there; at which the president and members of the congress attended, and other persons in public offices. The Chevalier de la Luzerne, minister plenipotentiary from the French king to the United States, was also present on the occasion. A charge was publicly addressed by the provost of the university to the students; in which he said, that he could not but congratulate them "on that auspicious day, which, amidst the confusions and desolations of war, beheld learning beginning to revive; and animated them with the pleasing prospect of seeing the sacred lamp of science burning with a still brighter flame, and scattering its invigorating rays over the unexplored desarts of this extensive continent; until the whole world should be involved in the united blaze of knowledge, liberty, and religion. When he stretched his views forward (he said), and surveyed the rising glories of America, the enriching consequences of their determined struggle for liberty, the extensive fields of intellectual improvement and useful invention, in science and arts, in agriculture and commerce, in religion and government, through which the unfettered mind would range, with increasing delight, in quest of the undiscovered treasure which yet lay concealed in the animal, vegetable, and mineral kingdoms of the new world; or in the other fertile sources of knowledge with which it abounded,—his heart swelled with the pleasing prospect, that the sons of that institution would distinguish themselves, in the different walks of life, by their literary contributions to the embellishments and increase of human happiness."

On the 10th of July, M. Ternay, with a fleet consisting

America.

fifting of feven fhips of the line, befides frigates, and a large body of French troops, commanded by the Count de Rochambeau, arrived at Rhode-Ifland; and the following day 6000 men were landed there. A committee from the general affembly of Rhode-Ifland was appointed to congratulate the French general upon his arrival: whereupon he returned an anfwer, in which he informed them, that the king his mafter had fent him to the affiftance of his good and faithful allies the United States of America. At prefent, he faid, he only brought over the vanguard of a much greater force deftined for their aid; and the king had ordered him to affure them, that his whole power fhould be exerted for their fupport. He added, that the French troops were under the ftricteft difcipline; and, acting under the orders of General Wafhington, would live with the Americans as their brethren.

346 A large body of French troops land at Rhode-Ifland.

A fcheme was foon after formed, of making a combined attack with Englifh fhips and troops, under the command of Sir Henry Clinton and Admiral Arbuthnot, againft the French fleet and troops at Rhode-Ifland. Accordingly a confiderable part of the troops at New-York were embarked for that purpofe. General Wafhington having received information of this, paffed the North River, by a very rapid movement, and, with an army increafed to 12,000 men, proceeded with celerity towards King's Bridge, in order to attack New-York; but learning that the Britifh general had changed his intentions, and difembarked his troops on the 31ft of the month, General Wafhington recroffed the river and returned to his former ftation. Sir Henry Clinton and the Admiral had agreed to relinquifh their defign of attacking the French and Americans at Rhode-Ifland as impracticable for the prefent.

347 Unfuccefsful expedition in the Jerfeys.

An unfuccefsful attempt was alfo made about this time in the Jerfeys by General Knyphaufen, with 7000 Britifh troops under his command, to furprife the advanced pofts of General Wafhington's army. They proceeded very rapidly towards Springfield, meeting little oppofition till they came to the bridge there, which was very gallantly defended by 170 of the continental troops, for 15 minutes, againft the Britifh army: but they were at length obliged to give up fo unequal a conteft, with the lofs of 37 men. After fecuring this pafs, the Britifh troops marched into the place, and fet fire to moft of the houfes. They alfo committed fome other depredations in the Jerfeys; but gained no laurels there, being obliged to return about the beginning of July without effecting any thing material.

But in South-Carolina the royal arms were attended with more fuccefs. Earl Cornwallis, who commanded the Britifh troops there, obtained a fignal victory over General Gates on the 16th of Auguft. The Action began at break of day, in a fituation very advantageous for the Britifh troops, but very unfavourable to the Americans. The latter were much more numerous; but the ground on which both armies ftood was narrowed by fwamps on the right and left, fo that the Americans could not properly avail themfelves of their fuperior numbers. The attack was made by the Britifh troops with great vigour, and in a few minutes the action was general along the whole line. It was at this time a dead calm with a little hazinefs in the air, which preventing the fmoke from rifing, occafioned fo thick a darknefs, that it was difficult to fee the effect of a very heavy and well fupported fire on both fides. The Britifh troops either kept up a conftant fire, or made ufe of bayonets, as opportunities offered; and after an obftinate refiftance during three quarters of an hour, threw the Americans into total confufion, and forced them to give way in all quarters. The continental troops behaved remarkably well, but the militia were foon broken, and left the former to oppofe the whole force of the Britifh troops. General Gates did all in his power to rally the militia, but without effect: the continentals retreated in fome order; but the rout of the militia was fo great, that the Britifh cavalry are faid to have continued the purfuit of them to the diftance of 22 miles from the place where the action happened. The lofs of the Americans was very confiderable: about 1000 prifoners were taken, and more are faid to have been killed and wounded, but the number is not very accurately afcertained. Seven pieces of brafs cannon, a number of colours, and all the ammunition-waggons of the Americans, were alfo taken. Of the Britifh troops, the killed and wounded amounted to 213. Among the prifoners taken was Major-general Baron de Kalb, a Pruffian officer in the American fervice, who was mortally wounded, having exhibited great gallantry in the courfe of the action, and received 11 wounds. The Britifh troops by which this victory was atchieved, did not much exceed 2000, while the American army is faid to have amounted to 6000; of which, however, the greateft part was militia.

348 Victory obtained by Lord Cornwallis over Gen. Gates.

349 Activity of Lieut. Co. Tarleton.

Lieutenant-colonel Tarleton, who had greatly diftinguifhed himfelf in this action, was detached the following day, with fome cavalry and light infantry, amounting to about 350 men, to attack a corps of Americans under General Sumpter. He executed this fervice with great activity and military addrefs. He procured good information of Sumpter's movements; and by forced and concealed marches came up with and furprifed him in the middle of the day on the 18th, near the Catawba fords. He totally deftroyed or difperfed his detachment, which confifted of 700 men, killing 150 on the fpot, and taking two pieces of brafs cannon, 300 prifoners, and 44 waggons.

350 General Arnold deferts the fervice of congrefs.

Not long after thefe events, means were found to detach Major-general Arnold, who had engaged fo ardently in the caufe of America, and who had exhibited fo much bravery in the fupport of it, from the interefts of the congrefs. Major Andre, adjutant-general to the Britifh army, was a principal agent in this tranfaction: or, if the overture of joining the king's troops came firft from Arnold, this gentleman was the perfon employed to concert the affair with him. More muft have been originally comprehended in the fcheme than the mere defertion of the American caufe by Arnold: The furrender of Weft-Point into the hands of the royal army, was the probable object; but whatever defigns had been formed for promoting the views of the Britifh government, they were fruftrated by the apprehending of Major Andre. He was taken in difguife, after having affumed a falfe name, on the 23d of September, by three American foldiers, to whom he offered confiderable rewards if they would have fuffered him to efcape, but without effect. Several papers written by Arnold were found upon him; and when Arnold had learnt that Major Andre was feized,

America.

451 Unhappy fate of Major Andre. seized, he found means to get on board a barge, and to escape to one of the king's ships. General Washington referred the case of Major Andre to the examination and decision of a board of general officers, consisting of Major-general Green, Major-general Lord Sterling, Major-general the Marquis de la Fayette, Major-general the Baron de Steuben, two other major-generals, and eight brigadier-generals. Major Andre was examined before them, and the particulars of his case inquired into; and they reported to the American commander in chief, that Mr Andre came on shore from the Vulture sloop of war in the night, on an interview with General Arnold, in a private and secret manner; that he changed his dress within the American lines; and, under a feigned name, and in a disguised habit, passed the American works at Stoney and Verplank's points, on the evening of the 22d of September; that he was taken on the morning of the 23d at Tarry-town, he being then on his way for New York: and that, when taken, he had in his possession several papers which contained intelligence for the enemy. They therefore determined, that he ought to be considered as a spy from the enemy; and that, agreeable to the law and usage of nations, he ought to suffer death. Sir Henry Clinton, Lieutenant-general Robertson, and the late American general Arnold, all wrote pressing letters to General Washington on the occasion, in order to prevent the decision of the board of general officers from being put in force: But their applications were ineffectual. Major Andre was hanged at Tappan, in the province of New-York, on the 2d of October. He met his fate with great firmness; but appeared somewhat hurt that he was not allowed a more military death, for which he had solicited.

352 His amiable qualities. He was a gentleman of very amiable qualities, had a taste for literature and the fine arts, and possessed many accomplishments. His death, therefore, was regretted even by his enemies; and the seeming severity of the determination concerning him was much exclaimed against in Great Britain. It was, however, generally acknowledged by impartial persons, that there was nothing in the execution of this unfortunate gentleman but what was perfectly consonant to the rules of war.

Arnold was made a brigadier-general in the king's service, and published an address to the inhabitants of America, dated from New-York, October 7, in which he endeavoured to justify his desertion of their cause.

353 Motives assigned by Arnold for his conduct. He said, that when he first engaged in it, he conceived the rights of his country to be in danger, and that duty and honour called him to her defence. A redress of grievances was his only aim and object; and therefore he acquiesced unwillingly in the declaration of independence, because he thought it precipitate. But what now induced him to desert their cause was the disgust he had conceived at the French alliance, and at the refusal of Congress to comply with the last terms offered by Great Britain, which he thought equal to all their expectations and all to their wishes.

The Americans, however, accounted for the conduct of Arnold in a different and in a more probable and satisfactory manner. They alledged that he had so involved himself in debts and difficulties by his extravagant manner of living in America, that he had rendered it very inconvenient for him to continue there: that after the evacuation of Philadelphia by the British troops, Arnold, being invested with the command in that city, had made the house of Mr Penn, which was the best in the city, his head-quarters. This he had furnished in an elegant and expensive manner, and lived in a style far beyond his income.

354 Different reasons alleged by the Americans. It was manifest, they said, that he could at first have no great aversion to the French alliance, because that when M. Gerard, minister plenipotentiary from the court of France, arrived at Philadelphia in July 1778, General Arnold early and earnestly solicited that minister, with his whole suite, to take apartments and bed and board at his house, until a proper house could be provided by the order of the congress. This offer M. Gerard accepted, and continued with him some weeks. The French minister resided upwards of 14 months in Philadelphia; during which time General Arnold kept up the most friendly and intimate acquaintance with him, and their was a continued interchange of dinners, balls, routes, and concerts: so that M. Gerard must have believed, that in General Arnold he had found and left one of the warmest friends the court of France had in America. He was also one of the first in congratulating the Chevalier de la Luzerne, the second French minister. About this time complaints and accusations were exhibited against him by the government of Philadelphia for divers mal-practices; among which charges were, the appropriation of goods and merchandise to his own use, which he had seized as British property in Philadelphia in July 1778. It was determined by a court-martial that his conduct was highly reprehensible; but he was indulgently treated, and was therefore only reprimanded by the commander in chief General Washington. It was in these circumstances, the Americans said, bankrupted in reputation and fortune, loaded with debts, and having a growing and expensive family, that General Arnold first turned his thoughts towards joining the royal arms.

355 Actions in South-Carolina. After the defeat of General Gates by Earl Cornwallis, that nobleman exerted himself to the utmost in extending the progress of the British arms, and with considerable effect. But one enterprise, which was conducted by Major Ferguson, proved unsuccessful. That officer had taken abundant pains to discipline some of the Tory militia, as they were termed; and with a party of these, and some British troops, amounting in the whole to about 1400 men, made incursions into the country. But on the 7th of October he was attacked by a superior body of Americans, at a place called King's-mountain, and totally defeated. One hundred and fifty were killed in the action, and 810 made prisoners, of which 150 were wounded. Fifteen hundred stands of arms also fell into the hands of the Americans, whose loss was inconsiderable. But the following month Lieutenant-Colonel Tarleton, with a party of 170, chiefly cavalry, attacked General Sumpter, who is said to have had 1000 men, at a place called Black-Stocks, and obliged him to retire. Sumpter was wounded, and about 120 of the Americans killed, wounded, or taken. Of the British troops about 50 were killed or wounded.

356 Capture of Mr Laurens. On the 3d of September, the Mercury, a congress packet, was taken by the Vestal, Captain Keppel, near Newfoundland. On board this packet was Mr Lau-

rens,

rens, late president of the congress, who was bound on an embassy to Holland. He had thrown his papers overboard, but great part of them were recovered without having received much damage. He was brought to London, and examined before the privy-council; in consequence of which he was committed close prisoner to the Tower on the 6th of October, on a charge of high treason. His papers were delivered to the ministry, and contributed to facilitate a rupture with Holland, as among them was found the sketch of a treaty of amity and commerce between the Republic of Holland and the United States of America.

At the beginning of the year 1781, an affair happened in America, from which expectations were formed by Sir Henry Clinton, that some considerable advantage might be derived to the royal cause. The long continuance of the war, and the difficulties under which the congress laboured, had prevented their troops from being properly supplied with necessaries and conveniencies.

357 Discontents among the American troops.

358 Revolt of the Pennsylvania line.

In consequence of this, on the first of January, the American troops that were hutted at Morris-town, and who formed what was called the *Pennsylvania line*, turned out, being in number 1300, and declared, that they would serve no longer, unless their grievances were redressed, as they had not received their pay or been furnished with the necessary clothing or provisions. It is said that they were somewhat inflamed with liquor, in consequence of rum having been distributed to them more liberally than usual, new-year's day being considered as a kind of festival. A riot ensued, in which an officer was killed, and four wounded; five or six of the insurgents were also wounded. They then collected the artillery, stores, provisions, and waggons, and marched out of the camp. They passed by the quarters of General Wayne, who sent a message to them, requesting them to desist, or the consequences would prove fatal. They refused, and proceeded on their march till the evening, when they took post on an advantageous piece of ground, and elected officers from among themselves. On the second day they marched to Middlebrook, and on the third to Princetown, where they fixed their quarters. On that day a flag of truce was sent to them from the officers of the American camp, with a message, desiring to know what were their intentions. Some of them answered, that they had already served longer than the time for which they were enlisted, and would serve no longer; and others, that they would not return, unless their grievances were redressed. But at the same time they repeatedly, and in the strongest terms, denied being influenced by the least disaffection to the American cause, or having any intentions of deserting to the enemy.

Intelligence of this transaction was soon conveyed to New-York. A large body of British troops were immediately ordered to hold themselves in readiness to move on the shortest notice, it being hoped that the American revolters might be induced to join the royal army.

359 Ineffectual attempts to induce them to join the royal army.

Messengers were also sent to them from General Clinton, acquainting them that they should directly be taken under the protection of the British government; that they should have a free pardon for all former offences; and that the pay due to them from the congress should be faithfully paid them without any expectation of military service, unless it should be voluntary, upon condition of their laying down their arms, and returning to their allegiance. It was also recommended to them to move beyond the South River; and they were assured, that a body of British troops should be ready to protect them whenever they desired it. These propositions were rejected with disdain; and they even delivered up two of Sir Henry Clinton's messengers to the congress. Joseph Reid, Esq; president of the state of Pennsylvania, afterwards repaired to them at Princeton, and an accommodation took place: such of them as had served out their full terms were permitted to return to their own homes, and others again joined the American army, upon receiving satisfactory assurances that their grievances should be redressed.

360 Exertions of Lord Cornwallis in North-Carolina.

On the 11th of January Lord Cornwallis advanced towards North Carolina. He wished to drive Gen. Morgan from his station, and to deter the inhabitants from joining him. The execution of this business was intrusted to Lieut. Col. Tarleton; who was detached with the light and legion infantry, the fusileers, the first battalion of the 71st regiment, about 350 cavalry, two field pieces, and an adequate proportion of men from the royal artillery, upward of 1100 in the whole. This detachment, after a progress of some days, by fatiguing marches, at about ten o'clock on the evening of the 16th of January, reached the ground which Morgan had quitted but a few hours before. The pursuit recommenced by two o'clock the next morning, and was rapidly continued through marshes and broken grounds till day light, when the Americans were discovered in front. Two of their videttes were taken soon after, who gave information that Morgan had halted and prepared for action, at a place called the Cowpens, near Pacolet river. The British, beside their field pieces, had the superiority in infantry, in the proportion of five to four, and in cavalry of more than three to one. Beside, nearly two thirds of the troops under Morgan were militia. Morgan had obtained early intelligence of Tarleton's force and advances; and had drawn up his men in two lines. The whole of the North and South Carolina militia present was put under the command of Col. Pickens, and formed the first line; which was advanced a few hundred yards before the second, with orders to form on the right of the second when forced to retire. The second line consisted of the light infantry under Lieut. Col. Howard, and the Virginia riflemen. Lieut. Col. Washington, with his cavalry, and about forty-five militia men, mounted and equipped with swords, under Lieut. Col. M'Call, were drawn up at some distance in the rear of the whole. The open wood in which they were formed, was neither secured in front, flank or rear. Without the delay of a single moment, and in despite of extreme fatigue, the light legion infantry and fusileers were ordered to form in line. Before the order was executed, and while Major Newmarsh, who commanded the latter corps, was posting his officers, the line, though far from complete, was led to the attack by Tarleton himself. The British advanced with a shout, and poured in an incessant fire of musquetry. Col. Pickens directed the militia not to fire till the British were within forty or fifty yards. This order, though executed with great firmness and success, was not sufficient

America. sufficient to repel the enemy. The American militia gave way on all quarters. The British advanced rapidly, and engaged the second line. The continentals, after an obstinate conflict, were compelled to retreat to the cavalry. Col. Ogilive, with his troop of forty men, had been ordered to charge the right flank of the Americans, and was engaged in cutting down the militia; but being exposed to a heavy fire, and charged at the same time by Washington's dragoons, was forced to retreat in confusion. A great number of the British infantry officers had already fallen, and nearly a proportionable number of privates. The remainder being too few and too much fatigued, could not improve the advantage gained over the continentals; and Tarleton's legion cavalry standing aloof instead of advancing, Lieut. Col. Howard seized the favourable opportunity, rallied the continentals, and charged with fixed bayonets, nearly at the same moment when Washington made his successful attack. The example was instantly followed by the militia. Nothing could exceed the astonishment of the British, occasioned by these unexpected charges. Their advance fell back, and communicated a panic to others, which soon became general. Two hundred and fifty horse which had not been engaged, fled through the woods with the utmost precipitation, bearing down such officers as opposed their flight; and the cannon were soon seized by the Americans, the detachment from the train being either killed or wounded in their defence. The greatest confusion now followed among the infantry. In the moment of it Lieut. Col. Howard called to them to lay down their arms, and promised them good quarters. Some hundreds accepted the offer, and surrendered. The first battalion of the 71st regiment, and two British light infantry companies laid down their arms to the American militia. The only body of infantry that escaped, was a detachment left at some distance to guard the baggage. Early intelligence of their defeat was conveyed to the officer commanding that corps by some royalists. What part of the baggage could not be carried off he immediately destroyed; and with his men mounted on the waggon and spare horses, he retreated to Lord Cornwallis. The British had 10 commissioned officers, and upward of 100 rank and file killed. Two hundred wounded, 29 commissioned officers, and above 500 privates prisoners, fell into the hands of the Americans, beside two pieces of artillery (first taken from the British at Saratoga, then retaken by them at Camden, and now recovered by the Americans) two standards, 800 muskets, 35 baggage waggons, and upward of 100 dragoon horses. Washington pursued Tarleton's cavalry for several miles; but the far greater part of them escaped. They joined their army in two separate divisions. One arrived in the neighbourhood of the British encampment upon the evening of the same day; the other under Tarleton appeared the next morning. Although Tarleton's corps had waged a most cruel warfare, and their progress had been marked with burnings and devastations, not a man of them was killed, wounded, or even insulted after he had surrendered. The Americans had only twelve men killed and sixty wounded.

This defeat of the troops under Tarleton, while it reanimated the desponding friends of America, and brightened their hopes, was a severe stroke to Lord Cornwallis, as the loss of his light infantry was a great disadvantage to him. The day after the event he employed in collecting the remains of Tarleton's corps, and in endeavouring to form a junction with General Leslie, who had been ordered to march towards him with a body of British troops from Wynnesborough. Considerable exertions were then made by part of the army, without baggage, to retake the prisoners in the hands of the Americans, and to intercept General Morgan's corps on its retreat to the Catawba. But that American officer, after his defeat of Tarleton, had made forced marches up into the country, and crossed the Catawba the evening before a great rain, which swelled the river to such a degree, as to prevent the royal army from crossing for several days; during which time the British prisoners were got over the Yadkin; whence they proceeded to Dan River, which they also passed, and on the 14th of February had reached Court-house, in the province of Virginia.

Lord Cornwallis employed a halt of two days in collecting some flour, and in destroying superfluous baggage and all his waggons, excepting those laden with hospital stores, salt, and ammunition, and four reserved empty in readiness for sick or wounded. Being thus freed from all unnecessary incumbrancee, he marched through North-Carolina with great rapidity, and penetrated to the remotest extremities of that province on the banks of the Dan. His progress was sometimes impeded by parties of the militia, and some skirmishes ensued, but he met with no very considerable opposition. On the first of February the king's troops crossed the Catawba at M'Cowan's Ford, where General Davidson, with a party of American militia, was posted, in order to oppose their passage; but he falling by the first discharge, the royal troops made good their landing, and the militia retreated. When Lord Cornwallis arrived at Hillsborough, he erected the king's standard, and invited, by proclamation, all loyal subjects to repair to it, and to stand forth and take an active part in assisting his Lordship to restore order and government. He had been taught to believe that the king's friends were numerous in that part of the country: but the event did not confirm the truth of the representations that had been given. The Royalists were but few in number, and some of them too timid to join the king's standard. There were, indeed, about 200 who were proceeding to Hillsborough, under colonel Pyle, in order to avow their attachment to the royal cause; but they were met accidentally, and surrounded by a detachment from the American army, by whom most of them were cut in pieces. Meanwhile General Greene was marching with great expedition with the troops under his command, in order to form a junction with other corps of American troops, that he might thereby be enabled to put some effectual stop to the progress of Lord Cornwallis.

361 Lord Cornwallis marches through North-Carolina.

In other places some considerable advantages were obtained by the royal arms. On the 4th of January, some ships of war with a number of transports, on board which was a large body of troops under the command of Brigadier-general Arnold, arrived at Westover, about 140 miles from the Capes of Virginia, where the troops immediately landed and marched to Richmond; which they reached without opposition, the

362 Large quantities of American stories destroyed by Arnold.

America. the militia that was collected having retreated on their approach. Lieutenant-colonel Simcoe marched from hence with a detachment of the British troops to Westham, where they destroyed one of the finest founderies for cannon in America, and a large quantity of stores and cannon. General Arnold, on his arrival at Richmond, found there large quantities of salt, rum, sail-cloth, and tobacco, the last of which he destroyed to a very great amount. The British troops afterwards attacked and dispersed some small parties of the Americans, took some stores and a few pieces of cannon, and on the 20th of the same month marched into Portsmouth. On the 25th, Captain Barclay, with several ships of war, and a body of troops under the command of Major Craig, arrived in Cape-Fear River. The troops landed about nine miles from Wilmington, and on the 28th entered that town. It was understood that their having possession of that town, and being masters of Cape-Fear River, would be productive of very beneficial effects to Lord Cornwallis's army.

General Greene having effected a junction about the 10th of March with a continental regiment of what were called *eighteen months men*, and two large bodies of militia belonging to Virginia and North-Carolina, formed a resolution to attack the British troops under the command of Lord Cornwallis. The American army marched from the High Rock Ford on the 12th of the month, and on the 14th arrived at Guildford. Lord Cornwallis, from the information he had received of the motions of the American general, concluded what were his designs. As they approached more

363 Different skirmishes. nearly to each other, a few skirmishes ensued between some advanced parties, in which the advantage was sometimes gained by the Americans and sometimes by the British. On the morning of the 15th, Lord Cornwallis marched with his troops at day-break in order to meet the Americans or to attack them in their encampment. About four miles from Guildford, the advanced guard of the British army, commanded by Lieutenant-colonel Tarleton, fell in with a corps of the Americans, consisting of Lieutenant-colonel Lee's legion, some Back-Mountain men and Virginian militia, with whom he had a severe skirmish, and was, at length, obliged to retreat.

The greater part of the country in which the action happened is a wilderness, with a few cleared fields interspersed. The American army was posted on a rising ground about a mile and a half from Guildford court house. It was drawn up in three lines: the front line was composed of the North-Carolina militia, under the command of the generals Butler and Eaton; the second line, of Virginian militia, commanded by the generals Stephens and Lawson, forming two brigades; the third line, consisting of two brigades, one of Virginia and one of Maryland continental troops, commanded by General Huger and Colonel Williams. Lieutenant-colonel Washington, with the dragoons of the first and third regiments, a detachment of light infantry composed of continental troops, and a regiment of riflemen under colonel Lynch, formed a corps of observation for the security of their right flank. Lieutenant-colonel Lee, with his legion, a detachment of light infantry, and a corps of riflemen under Colonel Campbell, formed a corps of observation for the security of their left flank. The attack of the American army was directed to be made by Lord Cornwallis in the following order: On the right, the regiment of Bose and the 71st regiment, led by Major-general Leslie, and supported by the first battalion of guards; on the left, the 23d and 33d regiments, led by Lieutenant-colonel Webster, and supported by the grenadiers and second battalion of guards commanded by Brigadier-general O'Hara; the Yagers and light infantry of the guards remained in a wood on the left of the guns, and the cavalry in the road, ready to act as circumstances might require.

364 Battle at Guildford. About half an hour after one in the afternoon, the action commenced by a cannonade, which lasted about twenty minutes; when the British troops advanced in three columns and attacked the North-Carolinian brigades with great vigour, and soon obliged part of these troops to quit the field: but the Virginia militia gave them a warm reception, and kept up a heavy fire for a long time, till, being beaten back, the action became general almost every where. The American corps under the lieutenant-colonels Washington and Lee were also warmly engaged, and did considerable execution. Lieutenant-colonel Tarleton had directions to keep his cavalry compact, and not to charge without positive orders, excepting to protect any of the corps from the most evident danger of being defeated. The excessive thickness of the woods rendered the British bayonets of little use, and enabled the broken corps of Americans to make frequent stands with an irregular fire. The second battalion of the guards first gained the clear ground near Guildford court-house, and found a corps of continental infantry, superior in number, formed in an open field on the left of the road. Desirous of signalizing themselves, they immediately attacked and soon defeated them, taking two six pounders: but as they pursued the Americans into the wood with too much ardour, they were thrown into confusion by a heavy fire, and instantly charged and driven back into the field by Lieutenant-colonel Washington's dragoons, with the loss of the two six pounders they had taken. But the American cavalry were afterwards repulsed, and the two six pounders again fell into the hands of the British troops. The British troops having at length broken the second Maryland regiment, and turned the left flank of the Americans, got into the rear of the Virginia brigade, and appeared to be gaining their right, which would have encircled the whole of the continental troops, when Gen. Greene thought it prudent to order a retreat. Many of the American militia dispersed in the woods; but the continental troops retreated in good order to Reedy-Fork River, and crossed at the ford about three miles from the field of action, and there halted. When they had collected their stragglers, they retreated to the iron-works, ten miles distant from Guildford, where they encamped. They lost their artillery and two waggons laden with ammunition. It was a hard fought action, and lasted an hour and a half. Of the British troops, the loss, as stated by Lord Cornwallis, was 532 killed, wounded, and missing. General Greene in his account of the action transmitted to the Congress, stated the loss of the continental troops to amount to 329 killed, wounded, and missing; but he made no estimate of the loss of the militia, which was some what more than 100. Lieutenant-colonel Stuart was killed in the action;

365 The Americans defeated.

America. tion; and Lieutenant-colonel Webster, and the captains Schutz, Maynard, and Goodriche, died of the wounds that they had received in it. Brigadier-general O'Hara, Brigadier-general Howard, and Lieutenant-coloned Tarleton, were also wounded. Of the Americans the principal officer killed was Major Anderson of the Maryland line, and the generals Stephens and Huger were wounded.

366 Hardships endured by the British troops.

The British troops underwent great hardships in the course of this campaign; and in a letter of Lord Cornwallis's to Lord George Germain, dated March 17th he observed, that "the soldiers had been two days without bread." His lordship quitted Guildford three days after the battle which was fought in that place; and on the 7th of April, after a retreat marked with proofs of great alarm and precipitation, arrived in the neighbourhood of Wilmington. Soon after, General Greene, notwithstanding his late defeat, endeavoured to make some vigorous attempts against the king's forces in South-Carolina. Lord Rawdon had been appointed to defend the post of Camden, with about 800 British and provincials; and on the 19th of April General Greene appeared before that place with a large body of continentals and militia. He found it, however, impossible to attempt to storm the town with any prospect of success; and therefore endeavoured to take such a position as should induce the British troops to sally from their works. He posted the Americans about a mile from the town, on an eminence which was covered with woods, and flanked on the left by an impassable swamp. But on the morning of the 25th, Lord Rawdon marched out of Camden, and attacked General Greene in his camp. The Americans made a vigorous resistance, but were at length compelled to give way; and the pursuit is said to have been continued three miles. For some time after the action commenced, General Greene entertained great hopes of defeating the British troops; in which, as the Americans were superior in point of numbers, he would probably have succeeded, had not some capital military errors been committed by one or two of the officers who served under him. On the American side Colonel Washington had behaved extremely well in this action, having made upwards of 200 of the English prisoners, with 10 or 12 officers, before he perceived that the Americans were abandoning the field of battle. The loss of the English was about 100 killed and wounded. Upwards of 100 of the Americans were taken prisoners; and, according to the account published by General Greene, they had 126 killed and wounded. After this action, Greene retreated to Rugeley's mills, 12 miles from Camden, in order to collect his troops and wait for reinforcements.

367 General Greene attacked in his camp by Lord Rawdon, and defeated.

Notwithstanding the advantage which Lord Rawdon had obtained over General Greene at Camden, that nobleman soon after found it necessary, having burned the goal, mills, many private houses, and a part of his own baggage, to quit that post; and the Americans made themselves masters of several other posts that were occupied by the king's troops, and the garrisons of which were obliged to surrender themselves prisoners of war. These troops were afterwards exchanged under a cartel which took place between Lord Cornwallis and General Greene for the release of all prisoners of war in the southern district. After these events, General Greene laid close siege to Ninety-six, which was considered as the most commanding and important of all the posts in the back country; and on the 19th of June he attempted to storm the garrison, but was repulsed by the gallantry of the British troops, with the loss of about 150 killed, wounded, and missing. General Greene then raised the siege, and retired with his army behind the Saluda, to a strong situation, within 16 miles of Ninety-six.

America. 368 Afterwards lays siege to Ninety six; but is repulsed.

On the 18th of April a large body of British troops, under the command of Major-general Philips and Brigadier-general Arnold, embarked at Portsmouth in Virginia, in order to proceed on an expedition for the purpose of destroying some of the American stores. A party of light-infantry were sent 10 or 12 miles up the Chickahomany; where they destroyed several armed ships, sundry ware-houses, and the American state ship-yards. At Petersburg, the English destroyed 4000 hogsheads of tobacco, one ship, and a number of small vessels on the stocks and in the river. At Chesterfield court-house, they burnt a range of barracks for 2000 men and 300 barrels of flour. At a place called *Osborn's*, they made themselves masters of several vessels loaded with cordage and flour, and destroyed about 2000 hogsheads of tobacco, and sundry vessels were sunk and burnt. At Warwick, they burnt a magazine of 500 barrels of flour, some fine mills belonging to Colonel Carey, a large range of public rope-walks and store-houses, tan and bark houses full of hides and bark, and great quantities of tobacco. A like destruction of stores and goods was made in other parts of Virginia.

369 Destruction of American stores.

From the account already given of some of the principal military operations of the present year in America, it appears, that though advantages had been gained by the royal troops, yet no event had taken place from which it could rationally be expected that the final termination of the war would be favourable to Great-Britain. It was also a disadvantageous circumstance, that there was a misunderstanding between Admiral Arbuthnot and Sir Henry Clinton, and a mutual disapprobation of each other's conduct. This was manifest from their dispatches to government, and especially from those of General Clinton, whose expressions respecting the conduct of the admiral were by no means equivocal.

370 Misunderstanding between the British admiral and general.

On the 16th of March 1781, a partial action happened off the Capes of Virginia, between the fleet under Admiral Arbuthnot, consisting of seven ships of the line and one fifty-gun ship, and a French squadron consisting of the same number of ships of the line, and one forty-gun ship. Some of the ships in both fleets received considerable damage in the action, and the loss of the English was 30 killed and 73 wounded; but no ship was taken on either side. The British fleet, however, claimed the advantage; as the French were obliged to retire, and were supposed to be prevented by this action from carrying troops upon the Chesapeak, in order to attack General Arnold and impede the progress of Lord Cornwallis. But it was thought an unfortunate circumstance, that some time before this engagement the Romulus, a ship of 44 guns, was captured by the French off the Capes of Virginia.

371 Action between the British and French fleets off the capes of Virginia.

Lord Cornwallis, after his victory over General Greene at Guildford, proceeded, as we have seen, to Wil-

America.

372 Proclamation by Lord Cornwallis.

Wilmington, where he arrived on the 7th of April. But before he reached that place, he published a proclamation, calling upon all loyal subjects to stand forth and take an active part in restoring good order and government; and declaring to all persons who had engaged in the present rebellion against his majesty's authority, but who were now convinced of their error, and desirous of returning to their duty and allegiance, that if they would surrender themselves with their arms and ammunition at head quarters, or to the officer commanding in the districts contiguous to their respective places of residence, on or before the 20th of that month, they should be permitted to return to their homes upon giving a military parole; they would be protected, in their persons and properties, from all sorts of violence from the British troops; and would be restored, as soon as possible, to all the privileges of legal and constitutional government. But it does not appear that any considerable number of the Americans were allured by these promises to give any evidences of their attachment to the royal cause.

On the 20th of May, his Lordship arrived at Petersburg in Virginia, where he joined a body of British troops that had been under the command of Major-general Philips; but the command of which, in consequence of the death of that officer, had devolved upon Brigadier-general Arnold. Before this junction he had encountered considerable inconveniences from the difficulty of procuring provisions and forage; so that in a letter to Sir Henry Clinton, he informed him, that his cavalry wanted every thing, and his infantry every thing but shoes. He added, that he had experienced the distresses of marching hundreds of miles in a country chiefly hostile, without one active or useful friend, without intelligence, and without communication with any part of the country.

On the 26th of June, about six miles from Williamsburg, Lieutenant-colonel Simcoe, and 350 of the queen's rangers, with 80 mounted yagers, were attacked by a much superior body of the Americans;

373 Different actions.

but whom they repulsed with great gallantry and with equal success, making four officers and twenty private men prisoners. The loss of the Americans in this action is said to have been upwards of 120, and that of the British troops not more than 40.

On the 6th of July an action happened near the Green Springs in Virginia, between a reconnoitring party of the Americans under General Wayne, amounting to about 800, and a large part of the British army under Lord Cornwallis; in which the Americans had 127 killed and wounded, and the loss of the royal troops is supposed to have been considerably greater. It was an action in which no small degree of military skill and courage was exhibited by the Americans. In a variety of skirmishes, the Marquis de la Fayette very much distinguished himself, and displayed the utmost ardour in the American cause.

374 General Greene defeats Col. Stuart.

In South-Carolina, an action happened on the 9th of September near the Eutaw Springs, between a large body of British troops under the command of Lieutenant-colonel Stuart and an equal body of Americans, under the command of General Greene. It was an obstinate engagemen tt and lasted near two hours. The British, with a considerable loss, were in the first part of the battle routed in all quarters, but some having taken post in a piquetted garden, and others thrown themselves into a brick house, the eagerness of the American pursuit was considerably checked, and gave Colonel Stuart an opportunity on the evening of the next day, to abandon the Eutaw, and march towards Charleston, taking a number of his wounded, and about one thousand stand of arms.

375 Expedition against New-London.

In the course of the same month, General Arnold was sent on an expedition against New-London, in Connecticut, where he destroyed a great part of the shipping, and an immense quantity of naval stores, European manufactures, and East and West India commodities. The town itself was also burnt, which is said, but untruly, to have been unavoidable, on account of the explosions of great quantities of gun-powder which happened to be in the store-houses that were set on fire. A fort, of which it was thought necessary to gain possession in this expedition, was not taken without considerable loss. This was Fort-Griswold; which was defended by the Americans with great gallantry, and the assault was made by the English with equal bravery. The British troops entered the works with fixed bayonets, and were opposed with great vigour by the garrison with long spears. After a most obstinate defence of near forty minutes, the assailants gained possession of the fort, in which 85 Americans were found dead, and 60 wounded, most of them mortally; but of the killed, it is painful to observe, that the greater number fell after the British entered the fort, and when resistance had ceased. Of the British troops Major Montgomery was killed by a spear in entering the American works; and 192 men were also killed and wounded in this expedition.

376 Critical situation of Lord Cornwallis.

Notwithstanding the advantages that Lord Cornwallis had obtained over the Americans, his situation in Virginia began by degrees to be very critical; and the rather because he did not receive those reinforcements and supplies from Sir Henry Clinton, of which he had formed expectations, and which he conceived to be necessary to the success of his operations. Indeed, the commander in chief was prevented from sending those reinforcements to Lord Cornwallis which he otherwise might have done, by his fears respecting New-York, against which he entertained great apprehensions that General Washington intended to make a very formidable attack. In fact, that able American general had this object in view; and while the attack was in serious contemplation, a letter from him detailing the particulars of the intended operations of the campaign, being intercepted, fell into the hands of Sir Henry Clinton. After the plan was changed, the royal commander was so much under the impression of the intelligence contained in the intercepted letter, that he believed every movement towards Virginia to be a feint, calculated to draw off his attention from the defence of New-York. Under the influence of this opinion he bent his whole force to strengthed that post, and suffered the French and American armies to pass without any molestation. When the first opportunity of striking at them was elapsed, then for the first time he was brought to believe that the allies had fixed on Virginia, for the theatre of their combined operations. As truth may be made to answer the purposes of deception, so no feint of attacking New-York, could have been more successful than the real intention.

America. tion. At the same time Gen. Washington, by a variety of judicious military manœuvres, in which he completely out-generalled the British commander, increased his apprehensions about New-York, and prevented him from sending proper assistance to Lord Cornwallis. Having for a considerable time kept Sir Henry Clinton in perpetual alarm in New-York, though with an army much inferior to the garrison of that city, General Washington suddenly quitted his camp at White-Plains, crossed the Delaware, and marched towards Virginia, apparently with a design to attack Lord Cornwallis. Sir Henry Clinton then received information, that the Count de Grasse, with a large French fleet, was expected every moment in the Chesapeak, in order to co-operate with General Washington. In the mean time, Lord Cornwallis had taken possession of the posts of York-Town and Gloucester in Virginia. He applied himself with the utmost diligence to fortify these posts, and to render them equally respectable by land and water. His whole force amounted to about 7000 excellent troops. Before his lordship had fixed himself and army in these posts, a series of manœuvres had taken place between him and the Marquis de la Fayette; in which the British general displayed the boldness of enterprise, and the marquis the judgment of age, blended with the ardor of youth. Fayette, under various pretences, sent the Pennsylvania troops to the south side of James River; collected a force in Gloucester county; and made sundry excellent arrangements, which he early communicated to Count de Grasse by an officer.

377 Allied army arrive at Head of Elk. The French and American armies continued their march from the northward, till they arrived at the Head of Elk: within an hour after, they received an express from Count de Grasse, with the joyful account of his arrival and situation. This circumstance will appear the more remarkable, when we consider the original distance of the parties, as well from the scene of action as from each other, and the various accidents, difficulties, and delays, to which they were all liable. The greatest harmony subsisted between Washington and Rochambeau, which lessened some of the difficulties attending their joint operations. The former being without a sufficiency of money to supply his troops, applied to the count for a loan, which was instantly granted. In order to hasten the arrival of the allied troops, de Grasse selected seven vessels, drawing the least water, to transport them down the Chesapeak Bay. But the moment they were ready to sail on this service, the count was obliged to prepare for repelling the British fleet. When Mr de Barras arrived, he sent up those transports he brought with him for the troops: de Grasse after that added to them as many frigates as he could. By the 25th of September all the troops were arrived and landed at Williamsburg, and preparations were made with all possible dispatch for putting the army in a situation to move down towards York Town. General Washington and Count de Rochambeau, with their suites and other officers, had reached Williamsburg by hard travelling, on the 14th, eleven days sooner. Here the general found a vessel waiting to convey him to the Capes of Virginia, sent by Count de Grasse, as he could not with propriety leave his fleet. The commander in chief and the Count de Rochambeau, accompanied by Generals Chastellux, Du Portail, and Knox, immediately proceeded to visit the count on board the Ville de Paris. A council was held, and the Count de Grasse detailed his engagements to be in the West Indies at the latter end of October or beginning of November. But he finally agreed to continue in the Chesapeak until the operation against Lord Cornwallis should be decided. After which the company returned. America.

All the American and French troops formed a junction at Williamsburg. The Marquis de la Fayette had been joined by 3000 under St Simon some days before the 25th of September. The whole regular force thus collected amounted to between 11 and 12,000 men. The militia of Virginia were also called out to service, and were commanded by Gov. Nelson. On the 27th Gen. Washington gave out in general orders—"If the enemy should be tempted to meet the army on its march, the general particularly enjoins the troops to place their principal reliance on the bayonet, that they may prove the *vanity of the boast which the British make of their peculiar prowess in deciding battles with that weapon.*" The next morning the army marched, and halted about two miles from York Town just before sun set. The officers and soldiers were ordered to lie on their arms the whole night. On the 30th, Col. Scammel (being officer of the day) in approaching the enemy's outer works, to see if they had really left them, was mortally wounded and taken prisoner by a party of the enemy's horse, which lay secreted. This day Lord Cornwallis was closely invested in York Town. The French extended from the river above the town to a morass in the centre, where they were met by the Americans, who occupied the opposite side from the river to that spot. The post at Gloucester Point was, at the same time, invested by the Duke de Lauzun with his legion, and a number of Virginia militia under General Weeden. 378 Number of forces.

Before the troops left Williamsburg, Gen. Washington received a letter from the Count de Grasse, informing him, that in case of the appearance of a British fleet, the count conceived it to be his duty to go out and meet them at sea, instead of fighting in a confined situation. This information exceedingly alarmed the general, who instantly saw the probability of the British fleet's manœuvring in such manner, as to reinforce or withdraw Lord Cornwallis. To prevent a measure pregnant with so much evil, his excellency wrote to the count on the 26th: "I am unable to describe the painful anxiety under which I have laboured since the reception of your letter of the 23d instant. It obliges me warmly to urge a perseverence in the plan agreed upon. The attempt upon York, under the protection of your shipping is as certain of success as a superior force and a superiority of measures can render any military operation. The capture of the British army is a matter so important in itself and in its consequences, that it must greatly tend to bring an end to the war.—If your excellency quits the Bay, an access is open to relieve York, of which the enemy will instantly avail themselves. The consequence of this will be, not only the disgrace, but the probable disbanding of the whole army; for the present seat of war being such, as absolutely precludes the use of waggons, from the great number of large rivers which intersect the country, there will be a total want of provisions. This province has been 379 Gen. Washington's letters to Count de Grasse.

so exhausted, that subsistence must be drawn from a distance, and that can only be done by a superior fleet in the Bay. I earnestly beg your excellency to consider, that if by moving your fleet from the situation agreed upon, we lose the present opportunity, we shall never hereafter have it our power to strike so decisive a stroke, and the period of an honorable peace will be further distant than ever. Supposing the force, said to have arrived under Adm. Digby, to be true, their whole force united cannot be such as to give them any hope of success in the attacking your fleet. I am to press your excellency to persevere in the scheme so happily concerted between us. Permit me to add, that the absence of your fleet from the Bay may frustrate our design upon the garrison at York. For, in the present situation, Lord Cornwallis might evacuate the place with the loss of his artillery, baggage, and a few men—sacrifices, which would be highly justifiable, from the desire of saving the body of the army.—The Marquis de la Fayette carries this. He is not to pass the Cape for fear of accident, in case you should be at sea." This letter, with the Marquis's persuasions, had the desired effect; and the same hour when the combined army appeared before York-Town, the French fleet was brought to the mouth of York river, and by their position effectually covered all subsequent military operations, and prevented either the retreat or succour of Lord Cornwallis's army by water. The posts of York and Gloucester were the most favourable of any in the country for besieging the British, and preventing their escape, when the siege was supported by a superior land and naval force.

380
Cornwallis's situation.

Lord Cornwallis was sufficiently strong for fighting the Marquis de la Fayette, even after he had been joined by St Simon; and is thought to have been mistaken in not engaging them either separately or together. The moment he heard that the allied troops were at the Head of Elk, and that de Grasse was arrived with so powerful a fleet at the Chesapeak, his lordship should have pushed off for Charleston. Therefore it was that Gen. Greene wrote to Baron Steuben on the 17th—"Nothing can save Cornwallis but a rapid retreat through North Carolina to Charlestown." His lordship's conduct was influenced by an expectation of a reinforcement from Sir Henry Clinton, and a full persuasion that those exertions would be made at New-York, and such a naval strength would arrive from thence in time, as would effectually relieve him. This may be gathered from his writing on the 16th: "If I had no hopes of relief, I would rather risk an action than defend my half-finished works. But as you say, Adm. Digby is hourly expected, and have promised exertions to assist me, I do not think myself justifiable in putting the fate of the war upon so desperate an attempt." He must have meant that of fighting Fayette and St Simon, for the troops of Generals Washington and Rochambeau did not arrive till afterward. Fayette had taken a strong position: but the attempt would not have appeared so desperate to his lordship, had he known the real number of the enemy.

The trenches were opened by the combined armies on the 6th of October, at 600 yards distance from Cornwallis's works. The night being dark and rainy was well adapted to the service, in which there was not a man hurt. In the afternoon of the 9th, the redoubts and batteries being completed, a general discharge of 24 and 18 pounders and of 10 inch mortars commenced by the Americans on the right, and continued all night without intermission. The next morning, the French opened their batteries on the left, and a tremendous roar of canon and mortars was continued for six or eight hours without ceasing. There was an incessant fire through the succeeding night. By one of the French shells, the Charon of 44 guns and a transport ship were set on fire and burnt. The following morning, the enemy's other guard ship was fired by one of the American shells and consumed. At night, the besiegers opened their second parallel, 200 yards from the works of the besieged. The Americans had 3 men killed and 1 wounded by a French cannon, which fired too low. On the 14th in the evening, an American battalion was ordered into the second parallel, and to begin a large battery in advance on the right. A few minutes before they began to break ground, the enemy kept a constant fire upon them: one of their shells burst in centre of the battalion, and killed a captain and one private, and wounded a second. The fire of the besieged was very great through the night; and it was thought that the besiegers lost as many men within 24 hours at this period, as they had done nearly the whole siege before.

381
British redoubts taken.

Two redoubts, which were advanced about 200 yards on the left of the British, greatly impeded the progress of the combined armies. An attack on these was therefore proposed.—To excite a spirit of emulation the reduction of the one was committed to the French, of the other to the Americans. The light infantry of the latter were commanded by the Marquis de la Fayette; and the service was allotted to a select corps. The Marquis said to General Washington—"The troops should retaliate on the British, for the cruelties they have practised." The general answered—"You have full command, and may order as you please." The marquis ordered the party to remember New London, and to retaliate, by putting the men in the redoubt to the sword after having carried it. The men marched to the assault with unloaded arms, at dark on the night of the 14th, passed the abatis and palisades, and attacking on all sides carried the redoubt in a few minutes, with the loss of 8 killed and 28 wounded. Lieut. Col. Laurens personally took the commanding officer. The colonel's humanity and that of the Americans so overcame their resentments, that they spared the British. When bringing them off as prisoners, they said among themselves—"Why! how is this? We were ordered to put them to death." Being asked by others why they had not done it, they answered—"We could not, when they begged and cried so upon their knees for their lives." About five of the British were killed, and 1 major, 1 captain, and 1 ensign, and 20 privates captured. Col. Hamilton, who conducted the enterprise with much address and intrepidity, in his report to the marquis, mentioned, to the honor of his detachment—"that, incapable of imitating examples of barbarity, and forgetting recent provocations, they spared every man that ceased to resist." The French were equally successful on their side. They carried the

 the redoubt committed to them with rapidity, but lost a considerable number of men. These two works being taken into the second parallel facilitated the subsequent operations.

The British were so weakened by the fire of the combined armies, but chiefly by sickness, that Lord Cornwallis could not venture any considerable number in the making of sallies. The present emergency however was such, that a little before day break of the morning of the 16th he ordered a sortie of about 400 men, under Lieut. Col. Abercromby, to attack two batteries which appeared to be in the greatest forwardness, and to spike the guns. Two detachments were appointed to the service; and both attacks were made with such impetuosity, that the redoubts which covered the batteries, were forced, and eleven pieces of cannon spiked. The French troops, who had the guard of that part of the intrenchment, suffered considerably. This successful action did honor to the officers and troops engaged, but produced no essential benefit. The cannon, being hastily spiked, were soon rendered again serviceable; and the combined forces were so industrious, that they finished their batteries, opened them about 4 o'clock in the afternoon, and fired briskly. Their several batteries were now covered with near 100 pieces of heavy ordnance; and the British works were so destroyed, that they could scarcely show a single gun.

382 British attempts an escape.

Thus was Lord Cornwallis reduced to the necessity of preparing for a surrender, or of attempting an escape. He determined upon the latter. Boats were prepared under different pretexts, for the reception of the troops by ten at night, in order to pass them over to Gloucester Point. The arrangements were made with the utmost secrecy. The intention was to abandon the baggage, and to leave a detachment behind to capitulate for the towns people, and for the sick and wounded, his lordship having already prepared a letter on the subject, to be delivered to Gen. Washington after his departure. The first embarkation had arrived at Gloucester Point, and the greater part of the troops were already landed, when the weather, which was before moderate and calm, instantly changed to a most violent storm of wind and rain. The boats with the remaining troops were all driven down the river, and the design of passing was not only entirely frustrated, but the absence of the boats rendered it impossible to bring back the troops from Gloucester. Thus weakened and divided, the army was in the most imminent danger. The boats however returned: and the troops were brought back without much loss in the course of the forenoon.

383 Cornwallis capitulates.

Matters were now hastening to a crisis, which could not be longer averted. The British works were sinking under the weight of the American and French artillery. The continuance of the allied fire, only for a few more hours, would reduce them to such a condition that it would be rashness to attempt their defence.—The time for expecting relief from New York was elapsed. The strength and spirits of the royal troops were worn down by constant watching, and unremitting fatigue. Lord Cornwallis therefore sent out a flag at 10 o'clock in the morning of the 17th with a letter to General Washington, requesting a cessation of arms for twenty-four hours, and that commissioners might be appointed for digesting the terms of capitulation. An answer was given; and a reply forwarded in the afternoon; to which Gen. Washington rejoined the next day, declaring the general basis on which the capitulation might take place. Commissioners were appointed—on the side of the allies Viscount de Noailles, and Lieut. Col. Laurens, whose father was in close confinement at the tower, while the son was drawing up articles by which an English nobleman and a British army became prisoners. While settling the terms, the viscount wished his lordship to state, upon his honor, the value of the military chest. His lordship declared it to be about 1800l. sterling. The viscount observed that the sum was so trifling, that it was not worth bringing into the account, and therefore was for leaving it entirely at Cornwallis's disposal. Laurens interfered, and observed to his colleague, that though it was natural for a subject of one of the greatest monarchs in the world to think 1800l. an inconsiderable sum, yet, for his part, being a subject of an infant state, struggling with infinite inconveniences, and where money was very rare, he must deem it a very considerable sum; and therefore he insisted that it should be accounted for. This was accordingly done; and afterward it was paid into the hands of Timothy Pickering, Esq; American quarter master general, to the amount of 2113l. 6s. sterling, estimating the dollar at 4s. 8d.—There being a manifest impropriety in the Americans stipulating for the return of the negroes, while they themselves were avowedly fighting for their own liberties, they covered their intention of repossessing them, under these general terms with which the fourth article closed—"It is understood, that any property obviously belonging to the inhabitants of these states, in the possession of the garrison, shall be subject to be reclaimed."

384 Surrender of York and Gloucester.

The posts of York and Gloucester were surrendered on the 19th. The honor of marching out with colours flying, which had been denied Gen. Lincoln, was now refused to Lord Cornwallis; and Lincoln was appointed to receive the submission of the royal army at York Town, precisely in the same way his own had been conducted about 18 months before. The troops of every kind that surrendered prisoners of war, exceeded 7000 men; but such was the number of sick and wounded, that there were only 3800 capable of bearing arms. The officers and soldiers retained their baggage and effects. Fifteen hundred seamen partook of the fate of the garrison. The Guadaloupe frigate of 24 guns, and a number of transports were surrendered to the conquerors: about 20 transports had been sunk or burnt during the siege. The land forces became prisoners to congress; but the seamen and ships were assigned to the French admiral. The Americans obtained a numerous artillery, 75 brass ordnance and 69 iron cannon, howitzers and mortars.

Lord Cornwallis endeavoured to obtain permission for the British and German troops to return to their respective countries, under engagements not to serve against France or America; and also an indemnity for those who had joined him: but he was obliged to consent, that the former should be retained in the governments of Virginia, Pennsylvania and Maryland; and that the latter, whose case lay with the civil authority of the states, should be given up to the unconditional

America. ditional mercy of their countrymen. His lordſhip however obtained permiſſion for the Bonetta ſloop of war to paſs unexamined, which gave an opportunity of ſcreening thoſe of the royaliſts who were moſt obnoxious to the reſentments of the Americans. He took care alſo to have it ſtipulated, that no article of the capitulation ſhould be infringed on pretext of repriſal. His lordſhip, with all civil and military officers, except thoſe of the latter who were neceſſarily left behind for the protection and government of the ſoldiers, were at liberty to go upon parole, either to Great Britain or New York. He acknowledged in his public letter, that the treatment which he and the army had received after the ſurrender, was perfectly good and proper. His lordſhip ſpake in theſe warm terms of the kindneſs and attention ſhown to them, by the French officers in particular—"Their deliberate ſenſibility of our ſituation, their generous and preſſing offers of money, both public and private, to any amount, has really gone beyond what I can poſſibly deſcribe."

385 Thankſgiving appointed by the general. On the 20th of October, the American commander in chief, congratulated in general orders the army on the glorious event of the preceding day; and tendered to the generals, officers and privates, his thanks in the warmeſt language. He with gratitude returned his ſincere acknowledgments to Gov. Nelſon of Virginia, for the ſuccours received from him and the militia under him. To ſpread the general joy in all hearts, he commanded that thoſe of the army, who were under arreſt, ſhould be pardoned and ſet at liberty. The orders cloſed with—Divine ſervice ſhall be performed to-morrow in the different brigades and diviſions. The commander in chief recommends, that all the troops that are not upon duty, do aſſiſt at it with a ſerious deportment, and that ſenſibility of heart which the recollection of the ſurpriſing and particular interpoſition of Providence in our favor claims."

The Britiſh fleet and army deſtined for the relief of Lord Cornwallis, arrived off the Cheſapeak on the 24th; but on receiving authentic accounts of his ſurrender, they returned to New York. A few days after their firſt return, the fleet was increaſed by four ſhips of the line: but ſuch was the ſuperiority of the French by de Barras's junction with the Count de Graſſe, that nothing ſhort of deſperate circumſtances could juſtify attempting a freſh engagement. Theſe circumſtances however exiſting, the Britiſh naval commanders uſed all poſſible expedition in refitting the ſhips, with the deſign of extricating Cornwallis and his army. The delay occaſioned by this buſineſs ſeemed to be compenſated by the arrival of the Prince William and Torbay men of war from Jamaica. It was determined that every exertion ſhould be uſed both by the fleet and army, to form a junction with the Britiſh force in Virginia. Sir Henry Clinton embarked with about 7000 of his beſt forces. It was nevertheleſs the 19th of October before the fleet could fall down to the Hook. They amounted to 25 ſhips of the line, 2 fifties, and 8 frigates. When they appeared off the Cheſapeak, the French made no manner of movement, though they had 36 ſhips of the line, being ſatisfied with their preſent ſucceſs. The main error, which paved the way to the capture of the Britiſh army, appears to be the omiſſion of ſending a larger force from the Weſt Indies than that which was diſpatched under Sir Samuel Hood. A few more ſhips in the firſt inſtance might have prevented that moſt woful diſappointment with which both Sir Henry Clinton and Lord Cornwallis have been painfully exerciſed.

386 De Graſſe fails for the Weſt-Indies. Every argument and perſuaſion was uſed with the Count de Graſſe to induce him to aid the combined army in an operation againſt Charleſtown; but the advanced ſeaſon, the orders of his court, and his own engagements to be punctual to a certain time fixed for his ulterior operations, prevented his compliance. His inſtructions had fixed his departure even to the 15th of October; he however early engaged to ſtay longer. Could he have extended his co-operation two months more, there would moſt probably have been a total extirpation of the Britiſh force in the Carolinas and Georgia. On the 27th, the troops under the Marquis St Simon began to embark for the Weſt Indies; and about the 5th of November the Count de Graſſe ſailed from the Cheſapeak.

The Marquis de la Fayette being about to leave America, the following expreſſions made a part of the orders iſſued by him previous to his departure from York Town—"Orders for the firſt brigade of light infantry, iſſued by major general the marquis de la Fayette, Oct. 31, 1781. In the moment the major general leaves this place, he wiſhes once more to expreſs his gratitude to the brave corps of light infantry, who for nine months paſt have been the companions of his fortunes. He will never forget, that with them alone of regular troops, he had the good fortune to manœuvre before an army, which after all its reductions, is ſtill ſix times ſuperior to the regular force he had at the time." Four days after, this brigade embarked for the Head of Elk; the invalids of the American troops deſtined for the northward having previouſly done it. The New Jerſey and part of the New York lines marched by land, and were to join the troops which went by water, at the Head of Elk. Such cavalry as were wanted by General Greene marched ſeveral days before; and on the 5th of November a reinforcement marched under Gen. St Clair, in order to ſtrengthen him for further offenſive operarations in South Carolina. The ſeaſon of the year was unfavorable for the return of the troops to the North river, ſo that they ſuffered much in doing it. But they and their comrades had been bleſſed with a ſeries of the moſt delightful weather from the beginning of their march toward York Town, until the reduction of the place.

387 Congreſs appoint a day of thankſgiving. No ſooner had congreſs received and read General Waſhington's letter, giving information of the reduction of the Britiſh army, than they reſolved, on the 24th of October, that they would at two o'clock go in proceſſion to the Dutch Lutheran Church, and return thanks to Almighty God, for crowning the allied arms of the United States and France, with ſucceſs by the ſurrender of the whole Britiſh army under the command of Earl Cornwallis. This army had ſpread waſte and ruin over the face of Virginia for 400 miles on the ſea-coaſt, and for 200 to the weſtward. Their numbers enabled them to go where they pleaſed; and their rage for plunder diſpoſed them to take whatever they eſteemed moſt valuable. The reduction of

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such an army occasioned transports of joy in the breast of every American. But that joy was increased and maintained, by the further consideration of the influence it would have in procuring such a peace as was desired. Two days after, the congress issued a proclamation for religiously observing throughout the United States, the 13th of December, as a day of thanksgiving and prayer. On the 29th of October they resolved, that thanks should be presented to Gen. Washington, Count de Rochambeau, Count de Grasse, and the officers of the different corps, and the men under their command, for their services in the reduction of Lord Cornwallis.—They also resolved to erect in York Town a marble column, adorned with emblems of the alliance between the United States and his Most Christian Majesty; and inscribed with a succinct narrative of the surrender of the British army. Two stands of colours taken from the royal troops, under the capitulation, were presented to Gen. Washington in the name of the United States in Congress assembled; and two pieces of field ordnance so taken, were by a resolve of Congress, to be presented by Gen. Washington to Count de Rochambeau, with a short memorandum engraved thereon, "that Congress were induced to present them from considerations of the illustrious part which he bore in effectuating the surrender." It was further resolved to request the Chevalier de Luzerne, to inform his most Christian Majesty, that it was the wish of Congress, that Count de Grasse might be permitted to accept a testimony of their approbation, similar to that which was to be presented to Count de Rochambeau. Legislative bodies, executive councils, city corporations, and many private societies, presented congratulatory addresses to Gen. Washington, accompanied with the warmest acknowledgments to Count de Rochambeau, Count de Grasse and the other officers in the service of his Most Christian Majesty. Places of public worship resounded with grateful praises to the Lord of Hosts, the God of battles, before, at, and after the day of thanksgiving. The singularly interesting event of captivating a second royal army, produced such strong emotions in numbers, both of ministers and people, that they could not wait the arrival of the day.

As no rational expectation now remained of a subjugation of the colonies, the military operations that succeeded in America were of little consequence. Some inconsiderable actions and skirmishes did indeed take place after that event; in which the refugees chiefly distinguished themselves, and discovered an inveterate

388 Sir Guy Carleton arrives at New-York, with powers to treat of peace.

animosity against the Americans. On the 5th of May 1782, Sir Guy Carleton arrived at New-York, being appointed to the command of the British troops in America in the room of Sir Henry Clinton. Two days after his arrival, he wrote a letter to General Washington, acquainting him, that Admiral Digby was joined with himself in a commission to treat of peace with the people of America; transmitting to him, at the same time, some papers tending to manifest the pacific disposition of the government and people of Britain towards those of America. He also desired a passport for Mr Morgan, who was appointed to transmit a similar letter of compliment to the congress. General Washington declined signing any passport till he had taken the opinion of congress upon that measure; and by them he was directed to refuse any passport for such a purpose. However, another letter was sent to General Washington, dated the 2d of August, signed by Sir Guy Carleton and Rear-admiral Digby, in which they informed him, that they were acquainted by authority that negociations for a general peace had already commenced at Paris; that Mr Grenville was invested with full powers to treat with all the parties at war; and was then at Paris in the execution of his commission. They farther informed him, that his Britannic majesty, in order to remove all obstacles to that peace which he so ardently wished to restore, had commanded his ministers to direct Mr Grenville, that the independency of the thirteen provinces should be proposed by him, in the first instance, instead of making it the condition of

389 Resolutions of congress in consequence thereof.

a general treaty. But some jealousies were entertained by the Americans, that it was the design of the British court either to disunite them, or to bring them to treat of a peace separately from their ally the king of France: they therefore resolved, that any man, or body of men, who should presume to make any separate or partial convention or agreement with the king of Great-Britain, or with any commissioner or commissioners under the crown of Great-Britain, ought to be considered and treated as open and avowed enemies of the United States of America; and also that those states could not with propriety hold any conference or treaty with any commissioners on the part of Great Britain, unless they should, as a preliminary thereto, either withdraw their fleets and armies, or else, in positive or express terms, acknowledge the independence of the said states. They likewise resolved, that any propositions which might be made by the court of Great Britain, in any manner tending to violate the treaty subsisting between them and the king of France, ought to be treated with every mark of indignity and contempt.

390 Different places evacuated by the British troops.

In the month of June, the town of Savannah, and the whole province of Georgia, were evacuated by the British troops; as was also Charleston, South-Carolina, about the close of the year. In the mean time, the negociations for peace being continued, provisional articles of peace were signed at Paris on the 30th of

391 Independency of America acknowledged.

November by the commissioner of his Britannic Majesty and the American commissioners, in which his Majesty acknowledged the united colonies of New-Hampshire, Massachusetts-Bay, Rhode-Island, and Providence Plantations, Connecticut, New-York, New-Jersey, Pensylvania, Delaware, Maryland, Virginia, North-Carolina, South-Carolina, and Georgia, to be "free, sovereign, and independent states." They had constituted themselves such on the 4th of July 1776; they had been acknowledged such by the French king on the 30th of January 1778, when he concluded with them a treaty of amity and commerce; Holland had acknowledged them as such April 19th 1782; Sweden acknowledged them as such February 5th 1783; Denmark the 25th February, Spain in March, and Russia in July, the same year.

392 The American army disbanded, and Gen. Washington resigns his commission.

The Definitive Treaty was signed on the 3d of September 1783; and in Aug. Sir Guy Carleton had received his final orders for the evacuation of New-York. Tuesday, November the 25th, was the day agreed upon for this evacuation. To prevent every disorder which

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which might otherwiſe enſue from ſuch an event, the American troops under the command of Gen. Knox marched from Haerlem to the Bowery-lane in the morning. They remained there till about one o'clock, when the Britiſh forces left the poſts in the Bowery, and the Americans marched forward and took poſſeſſion of the city. This being effected, Gen. Knox and a number of citizens on horſeback rode to the Bowery to receive their excellencies Gen. Waſhington and Governor Clinton, who, with their ſuites, made their public entry into the city on horſeback; followed by the lieut. governor and the members of council, for the temporary government of the ſouthern diſtrict, four abreaſt—Gen. Knox and the officers of the army eight abreaſt—citizens on horſeback, eight abreaſt—the ſpeaker of the aſſembly and citizens on foot, eight abreaſt. The proceſſion ceaſed at Cape's tavern. The governor gave a public dinner at Frances's tavern; at which the commander in chief and other general officers were preſent. The arrangements for the whole buſineſs were ſo well made and executed, that the moſt admirable tranquillity ſucceeded through the day and night. Soon after this event, the ſoldiers of the American army, chearfully reſuming the character of citizens, returned peaceably to their reſpective homes; while their beloved and ever-honoured commander, having taken a pathetic leave of his officers, repaired to Annapolis, and, on the 23d of December, at an audience with Congreſs (perhaps the moſt ſingular and intereſting that ever occurred) riſing with great dignity, he delivered this addreſs.

393 Gen. Waſhington reſigns his commiſſion to congreſs.

"—Mr. Preſident, The great events on which my reſignation depended having at length taken place, I have now the honour of offering my ſincere Congratulations to Congreſs, and of preſenting myſelf before them, to ſurrender into their hands the truſt committed to me, and to claim the indulgence of retiring from the ſervice of my country.

"Happy in the confirmation of our independence and ſovereignty, and pleaſed with the opportunity afforded the United States, of becoming a reſpectable nation, I reſign with ſatiſfaction the appointment I accepted with diffidence—a diffidence in my abilities to accompliſh ſo arduous a taſk; which however was ſuperſeded by a confidence in the rectitude of our cauſe, the ſupport of the ſupreme power of the union, and the patronage of Heaven.

"The ſucceſsful termination of the war has verified the moſt ſanguine expectations; and my gratitude for the interpoſition of Providence, and the aſſiſtance I have received from my countrymen, increaſes with every review of the momentous conteſt.

"While I repeat my obligations to the army in general, I ſhould do injuſtice to my own feelings not to acknowledge in this place, the peculiar ſervices and diſtinguiſhed merits of the gentlemen who have been attached to my perſon during the war. It was impoſſible the choice of confidential officers to compoſe my family ſhould have been more fortunate. Permit me, Sir, to recommend in particular thoſe who have continued in the ſervice to the preſent moment, as worthy of the favorable notice and patronage of Congreſs.

"I conſider it as an indiſpenſable duty to cloſe this laſt act of my official life by commending the intereſts of our deareſt country to the protection of Almighty God, and thoſe who have the ſuperintendence of them to his holy keeping.

"Having now finiſhed the work aſſigned me, I retire from the great theatre of action, and bidding an affectionate farewel to this auguſt body, under whoſe orders I have ſo long acted, I here offer my commiſſion, and take my leave of all the employments of public life."

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The general was ſo powerfully impreſſed, with the great and intereſting ſcenes that crowded in upon his imagination while ſpeaking, that he would have been ſcarce able to have uttered more than the cloſing period. He advanced and delivered to the preſident his commiſſion, with a copy of his addreſs. Having reſumed his place, he received in a ſtanding poſture the following anſwer of Congreſs; which the preſident delivered with elegance; but not without ſuch a ſenſibility as changed, and ſpread a degree of paleneſs over his countenance.

"Sir, The United States in Congreſs aſſembled receive, with emotions too affecting for utterance, the ſolemn reſignation of the authorities under which you have led their troops with ſucceſs through a perilous and a doubtful war. Called upon by your country to defend its invaded rights, you accepted the ſacred charge, before it had formed alliances, and whilſt it was without funds or a government to ſupport you. You have conducted the great military conteſt with wiſdom and fortitude, invariably regarding the rights of the civil power through all diſaſters and changes. You have by the love and confidence of your fellow-citizens, enabled them to diſplay their martial genius, and tranſmit their fame to poſterity.—You have perſevered, till theſe United States, aided by a magnanimous king and nation, have been enabled under a juſt Providence, to cloſe the war in freedom, ſafety, and independence; on which happy event we ſincerely join you in congratulations.

"Having defended the ſtandard of liberty in this new world: having taught a leſſon uſeful to thoſe who inflict and to thoſe who feel oppreſſion, you retire from the great theatre of action, with the bleſſings of your fellow-citizens—but the glory of your virtues will not terminate with your military command, it will continue to animate remoteſt ages.

"We feel with you our obligations to the army in general, and will particularly charge ourſelves with the intereſts, of thoſe confidential officers, who have attended your perſon to this affecting moment.

"We join you in commending the intereſts of our deareſt country to the protection of Almighty God, beſeeching him to diſpoſe the hearts and minds of its citizens, to improve the opportunity afforded them, of becoming a happy and reſpectable nation. And for you we addreſs to him our earneſt prayers, that a life ſo beloved, may be foſtered with all his care; that your days may be happy as they have been illuſtrious; and that he will finally give you that reward which this world cannot give."

Having thus reſigned his commiſſion into the hands of the preſident of that honourable body, he retired from public life amidſt the acclamations of his grateful and admiring countrymen.

According to the report of the committee appointed for that purpoſe, *the Foreign Debt* of the United States incurred by the war, amounted to 7,885,085 dollars, 394 Loſs of men and treaſure by the war.

America. dollars, and the *Domestic Debt* to 34,115,290, total, at 4s. 6d. each, equal to 9,450,084 l. Sterling, the interest of which at 6 *per. cent.* is 567,005l. But the cost to Great Britain is moderately computed at 115,654,914l. and the additional annual burthen by it 4,557,575 l. since January 1775. As to the loss of men during the war, the States of America, it is supposed, lost by the sword and in prison near 80,000 men; and by the British returns at New-York, the number of soldiers killed in the service amounted to 43,633.

Of the extent of territory, population, commerce, revenues and wealth of this growing empire; and, also, of the rise, progress, and establishment of the present happy form of government, a particular account shall be given, under the article UNITED STATES.

AMERICAN NIGHT-SHADE. See PHYTOLACCA.

AMERICAN GROUND-NUT. See ARRACHIS.

AMERICUS VESPUCIUS, a Florentine gentleman, from whom *America* derived its name.—The merchants of Seville having obtained permission to attempt discoveries as private adventurers, sent out four ships in 1499, under the command of Alonzo de Ojeda (who had accompanied Columbus in his second voyage), assisted by Americus Vespucius, who was known to be deeply skilled in the science of navigation. This fleet touched on that part of the western continent already discovered by Columbus, whose track Ojeda followed; and Americus, who was a man of much address, as well as possessed of considerable literary talents, by publishing the first voyages on the subject, and other artful means, gave his name to the New-World, in prejudice to the illustrious Genoese. The imposture, though long detected, has been sanctified by time: and the fourth division of the globe, so long unknown to the inhabitants of Europe, Asia, and Africa, still continues to be distinguished by the name of AMERICA.

AMERSFORT, a city in the Netherlands, in the province of Utrecht, seated on the river Ems, E. Long. 5. 20. N. Lat. 52. 14. The most remarkable things are, the town-house; the grand palace, which is triangular; the public walk, planted with trees; and the great church, dedicated to St George. The land to the east and south of this city is very fruitful; on the north there is nothing but pasture-ground, and on the west it is woody. Not far from hence is a mountain called *Amersfort-berg*, on which they have planted a vista of trees, which reaches to Utrecht.

AMERSHAM, or AGMONDESHAM, a market-town in Buckinghamshire, consisting of about 200 houses, with a free-school, and four alms-houses. It sends two members to parliament, and has a market on Tuesday. It is a rectory rated at 48l. 16s. 8d. in the king's books. The market-house is a very handsome structure. W. Long. 0. 15. N. Lat. 51. 47.

AMES (William, D. D.) a learned independent divine, famous for his controversial writings, was born in 1576, and educated at Christ's college, in Cambridge. In the reign of King James I. he left the university, and soon after the kingdom, on account of his being unwilling to conform to the rules of the church; and retired to the Hague, where he had not been long before he was invited to accept of the divinity-chair in the university of Franeker, in Friesland, which he filled with admirable abilities for above twelve years; during which his fame was so great, that many came from remote nations to be educated under him. He from thence removed to Rotterdam for a change of air, which his health demanded; and here he continued during the remainder of his life. His controversial writings, which compose the greatest part of his works, are chiefly against Bellarmine and the Arminians. He also wrote, 1. A fresh Suit against the Ceremonies. 2. *Lectiones in Psalmos Davidis.* 3. *Medulla Theologiæ;* and several pieces relative to the sciences. He died of an asthma, at Rotterdam, in Nov. 1633.

Amestrata, Amethyst.

AMESTRATA, a town of Sicily, (Cicero); *Amestratos*, (Stephanus); *Amastra* (Silius Italicus); *Multistratos*, (Polybius): Now *Mistretta*, in the Val di Demona, on the river Halesus. It was a very strong fort of the Carthaginians, besieged in vain by the Romans for seven months with considerable loss; at length, after another siege taken and razed (Diodor. Siculus).

AMETHYST, a transparent gem of a purple colour, which seems composed of a strong blue and a deep red, and, according as either of those prevails, affording different tinges of purple, sometimes approaching to violet, and sometimes even fading to a pale-rose colour. Though the amethyst is generally of a purple colour, it is nevertheless sometimes found naturally colourless, and may at any time be easily made so by putting it into the fire; in which pellucid or colourless state, it so resembles the diamond, that its want of hardness seems the only way of distinguishing it. Some derive the name *amethyst* from its colour, which resembles wine mixed with water; whilst others, with more probability, think it got its name from its supposed virtue of preventing drunkenness; an opinion which, however imaginary, prevailed to that degree among the ancients, that it was usual for great drinkers to wear it about their necks. Be this as it will, the amethyst is scarce inferior to any of the gems in the beauty of its colour; and in its purest state is of the same hardness, and at least of equal value, with the ruby and sapphire. It is found of various sizes, from the bigness of a small vetch, to an inch and an half in diameter, and often to much more than that in length. Its shape is extremely various, sometimes roundish, sometimes oblong, and at others flatted, at least on one side; but its most common appearance is in a crystalliform figure, consisting of a thick column, composed of four plants, and terminated by a flat and short pyramid, of the same number of sides; or else, of a thinner and longer hexangular column; and sometimes of a long pyramid, without any column. It makes the gayest figure in the last of these states, but is hardest and most valuable in the roundish and pebble-like form. The amethyst is found in the East and West-Indies, and in several parts of Europe; the oriental ones, at least some of the finer specimens, being so hard and bright as to equal any of the coloured gems in value. However, by far the greater number of amethysts fall infinitely short of these; as all the the European ones, and not a few of those brought from the East and West-Indies, are very little harder than common crystal.

Counterfeit or Factitious AMETHYST. Spars and crystals tinged red and yellow, &c. are sold for amethysts. The false ones come from Germany, are tinged by vapours in the mines, and contain some lead.

Amethysts may be counterfeited by glass, to which the

the proper colour or stain is given. There were fine ones made in France about the year 1690, which may even impose on connoisseurs, unless the stone be taken out of the collet.—The method of giving this colour to glass is directed as follows: Take chrystal-frit, made with the most perfect and fine tarso: Then prepare a mixture of manganese in powder, one pound; and zaffer prepared, one ounce and a half: Mix these powders well together; and add to every pound of the frit an ounce of this powder. Let it be put into the pots with the frit, not into the already made metal. When the whole has stood long enough in fusion to be perfectly pure, work it into vessels, and then will resemble the colour of the amethyst.

Amethyst in heraldry, a term for the purple colour in the coat of a nobleman, in use with those who blazon with precious stones, instead of metals and colours. This, in a gentleman's escutcheon, is called *Purpure;* and in those of sovereign princes, *Mercury*.

AMETHYSTEA, Amethyst: a genus of the monogynia order, belonging to the diandria class of plants; and, in the natural method, ranking under, the 42d order, *Verticillatæ*. The characters are: The *calyx* consists of a single-leaved perianthium, bell-shaped, angular, semiquinquefid, and persistent: The *corolla* is monopetalous; the border quinquepartite, the lowest division more expanding: The *stamina* consist of two slender filaments approximated; the antheræ are simple and roundish: the *pistillum* has a four-cleft germen; stylus, the size of the stamina; stigmata, two, acute: no *corolla:* the *seeds*, four, gibbous, and shorter than the calyx:—there is only one known species.

This plant is a native of Siberia, from whence the seeds were sent to the imperial garden at Petersburgh, and thence carried to Britain. It is an annual plant, with an upright stalk, which rises about a foot high. Towards the top it puts forth two or three small lateral branches, garnished with small trifid leaves, sawed on their edges, of a very dark green colour. The flowers appear in June or July, and are produced in small umbels at the extremities of the branches. They are of a fine blue colour, as are also the upper part of the branches, and the leaves immediately under the umbel, so that they make a fine appearance.

Culture. The seeds of the amethystea should be sown in autumn, as they are apt to remain a whole year in the ground, if kept till the spring. When the plants come up, nothing else is necessary than to keep them clear of weeds, and to thin them where they are too close. They ought to be sown where they are to remain, as they do not thrive when transplanted.

AMETHYSTINE is applied, in antiquity, to a kind of purple garment dyed of the hue of amethyst. In this sense amethystine differed from *Tyrian* as well as from *hyacinthine* purple, being a kind of medium between both.

AMHAR, or Amhara, a province of Abyssinia, said to extend 40 leagues from east to west. It is considered as the most noble in the whole empire, both on account of its being the usual residence of the Abyssinian monarchs, and having a particular dialect different from all the rest, which, by reason of the emperors being brought up in this province, is become the language of the court and of the politer people. Here is the famed rock Amba-geshen, where the young monarchs were formerly confined. See Amba.

AMHURST (Nicholas), an English poet and political writer, was born at Marden in Kent, and entered of St John's college Oxford; from whence he was expelled for irregularity of conduct and libertine principles. Retaining great resentment against the university on this account, he abused its learning and discipline, and some of the most respectable characters in it, in a poem published in 1724, called *Oculus Britanniæ*, and in a book intitled *Terræ Filius*. He published a Miscellany of Poems, sacred and profane; and, The Convocation, a poem in five cantos, which was a satire on the Bishop of Bangor's antagonists. But he is best known for the share he had in the political paper called *The Craftsman:* though, after having been the drudge of his party for near 20 years, he was as much forgot in the famous compromise of 1742 as if he had never been born; and, when he died in that year of a broken heart, was indebted to the charity of his bookseller for a grave.

AMIANTHUS, or Earth-flax, in natural history, a fibrous, flexile, elastic, mineral substance, consisting of short, abrupt, and interwoven filaments. It is found in Germany, in the strata of iron ore, sometimes forming veins of an inch in diameter. Its fibres are so flexible that cloth has been made of them, and the shorter filaments that separate in the washing of the stone may be made into paper in the common manner. For the method of its preparation for manufacture into cloth, see Asbestos.

Amianthus is classed by Mr Kirwan in the muriatic genus of earths, because it contains about a fifth part of magnesia. Its other constituents, are, flint, mild calcareous earth, barytes, clay, and a very small proportion of iron. It is fusible *per se* in a strong heat, and also with the common fluxus. It differs from asbestos in containing some ponderous earth.

AMICABLE, in a general sense, denotes any thing done in a friendly manner, or to promote peace.

Amicable-Benches, in Roman antiquity, were, according to Pitiscus, lower and less honourable seats allotted for the *judices pedanei*, or inferior judges, who, upon being admitted of the emperor's council, were dignified by him with the title *amici*.

Amicable-Numbers, such as are mutually equal to the sum of one another's aliquot parts. Thus the numbers 284 and 220 are amicable numbers: for the aliquot parts, 1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110, of 220, are together equal to the other number 284; and the aliquot parts 1, 2, 4, 71, 142, of 284, are together equal to 220.

AMICTUS, in Roman antiquity, was any upper garment worn over the tunica.

Amictus, among ecclesiastical writers, the uppermost garment anciently worn by the clergy; the other five being the alba, singulum, stola, manipulus, and planeta. The amictus was a linen garment, of a square figure, covering the head, neck, and shoulders, and buckled or clasped before the breast. It is still worn by the religious abroad.

AMICULUM, in Roman antiquity, a woman's upper garment, which differed from the pala. It was worn both by matrons and courtezans.

AMICUS curiæ, a law-term, to denote a bystander who informs the court of a matter in law that is doubtful or mistaken.

AMIDA, a god worshipped by the Japanese, who has

has many temples erected to him in the island of Japan, of which the principal is at Jedo. The Japanese have such a confidence in their idol Amida, that they hope to obtain eternal felicity by the frequent invocation of his name. One of the figures of this idol is represented at Rome.

AMIDA (anc. geog.), a principal city of Mesopotamia (Liber Notitiæ); *Ammæa* (Ptolemy); situated on a high mountain, on the borders of Assyria, on the Tigris, where it receives the Nymphius.—It was taken from the Romans, in the time of the emperor Constans, by Sapores king of Persia. The siege is said to have cost him 30,000 men; however, he reduced it to such ruin, that the emperor afterwards wept over it. According to Ammianus Marcellinus, the city was razed; the chief officers were crucified; and the rest, with the soldiers and inhabitants, either put to the sword or carried into captivity, except our historian himself, and two or three more, who, in the dead of the night, escaped through a postern unperceived by the enemy. The inhabitants of Nisibis, however, being obliged to leave their own city by Jovian's treaty with the Persians, soon restored Amida to its former strength; but it was again taken by Cavades in 501, but was restored to the Romans in 503. On the declension of the Roman power, it fell again into the hands of the Persians; but was taken from them by the Saracens in 899. It is now in the possession of the Turks. Here are above 20,000 Christians, who are better treated by the Turks than in other places. A great trade is carried on in this city, of red Turkey leather, and cotton cloth of the same colour. The Arabian name of Amida is *Diarbeker*, and the Turkish one *Kara Amed*. E. Long. 39. 0. N. Lat. 36. 58.

AMIENS, a large handsome city of France, the capital of Picardy. It is agreeably situated on the river Somme, and said to have received its Latin name *Ambianum* from being every where encompassed with water. It is a place of great antiquity; being mentioned by Cæsar as a town that had made a vigorous resistance against the Romans, and where he convened a general assembly of the Gauls after having made himself master of it. The emperors Antoninus and Marcus Aurelius enlarged it; and Constantine, Constans, Julian, and several others, resided here a considerable time. The town is encompassed with a wall and other fortifications; and the ramparts are planted with trees, which from a delightful walk. The river Somme enters Amiens by three different channels, under as many bridges; and these channels, after washing the town in several places, where they are of use in its different manufactures, unite at the other end by the bridge of S. Michael. Here is a quay for the boats that come from Abbeville with goods brought by sea. At the gate of Noyon there is a suburb remarkable for the abbey of S. Achen. Next to this gate you come to that of Paris, where they have a long mall between two rows of trees. The houses are well built; the streets spacious, embellished with handsome squares and good buildings; and the number of inhabitants between 40 and 50 thousand. The cathedral, dedicated to our Lady, is one of the largest and most magnificent churches in France; adorned with handsome paintings, fine pillars, chapels, and tombs; particularly the nave is greatly admired. The other places worth seeing are the palace of the bailiwic, the town-house, the square *des Fleurs*, and the great market-place.

Amiens was taken by the Spaniards, in 1597, by the following stratagem: Soldiers, disguised like peasants, conducted a cart laden with nuts, and let a bag of them fall just as the gate was opened. While the guard was busy in gathering up the nuts, the Spaniards entered and became masters of the town. It was retaken by Henry IV. who built a citadel there.

This town is the seat of a bishop, suffragan of Rheims, as also of a presidial, bailiwic, vidam, a chamber of accounts, and a generality. The bishop's revenue is 30,000 livres. They have some linen and woollen manufactures, and they also make a great quantity of black and green soap. It lies in E. Long. 2. 30. N. Lat. 49. 50.

AMILCAR, the name of several Carthaginian captains. The most celebrated of them is Amilcar Barcas, the father of Hannibal, who during five years infested the coast of Italy; when the Romans, sending out their whole naval strength, defeated him near Trapani, 242 years before Christ; and thus put an end to the first Punic war. Amilcar began the second, and landed in Spain, where he subdued the most warlike nations; but as he was preparing for an expedition against Italy, he was killed in battle, 228 years before the Christian æra. He left three sons, whom he had educated, as he said, like three lions, to tear Rome in pieces; and made Hannabal, his eldest son, swear an eternal enmity against the Romans.

AMILICTI, in the Chaldaic theology, denote a kind of intellectual powers, or persons in the divine hierarchy. The Amilicti are represented as three in number; and constitute one of the tryads, in the third order of hierarchy.

AMIRANTE, in the Spanish polity, a great officer of state, answering to the lord high-admiral in England.

AMISUS, the chief city of the ancient kingdom of Pontus. It was built by the Milesians, and peopled partly by them, and partly by a colony from Athens. It was at first a free city, like the other Greek cities in Asia; but afterwards subdued by Pharnaces king of Pontus, who made it his metropolis. It was taken by Lucullus in the Mithridatic war, who restored it to its ancient liberty. Close by Amisus stood another city called *Eupatoria*, from Mithridates Eupator its founder. This city was likewise taken by Lucullus, who levelled it with the ground; but it was afterwards rebuilt by Pompey, who united it with Amisus, giving them the name of *Pompeiopolis*. It was taken during the war between Cæsar and Pompey, by Pharnaces king of Pontus, who put most of its inhabitants to the sword; but Cæsar, having conquered Pharnaces, made it again a free city.

AMITERNUM, a town of the Sabines, in Italy, (Livy, Pliny); now extinct: The ruins are to be seen on the level ridge of a mountain, near S. Vittorino, and the Springs of the Aternus; not far from Aquila, which rose out of the ruins of Amiternum.

AMITTERE LEGEM TERRÆ, among lawyers, a phrase importing the loss of liberty of swearing in any court: The punishment of a champion overcome or yielding in battle, of jurors found guilty in a writ of attaint, and of a person outlawed.

AM-KAS, in history, a name given to a spacious saloon in the palace of the Great-Mogul, where he gives audience to his subjects, and where he appears on solemn festivals with extraordinary magnificence. His throne is supported by six large steps of massy gold, set with rubies, emeralds, and diamonds, estimated at 60,000,000l.

AMMA, among ecclesiastical writers, a term used to denote an abbess, or spiritual mother.

AMMAN, or AMMANT, in the German or Belgic policy, a judge who has the cognisance of civil causes. —It is also used among the French for a public notary, or officer who draws up instruments and deeds.

AMMANIA: A genus of the monogynia order, belonging to the tetrandria class of plants; and in the natural method ranking under the 17th order, *Calycanthemæ*. The characters are: The *calyx* is an oblong, erect, bell-shaped perianthium, with eight striæ, quadrangulated, octodentated, and persistent: The *corolla* is either wanting, or it consists of four ovate expanding petals inserted in the calyx: The *stamina* consist of four bristly filaments the length of the calyx; the antheræ are didymous: The *pistillum* has a large ovate germen, above; the stylus simple and very short; the stigma headed: The Pericarpium is a roundish four-celled capsule, covered by the calyx: the seeds are numerous and small.—Of this genus there are three species enumerated; all of them natives of warm climates. They have no beauty or other remarkable property.

AMMI, BISHOP'S WEED: A genus of the digynia order, belonging to the pentandria class of plants; and ranking, in the natural method, under the 45th order, *Umbellatæ*. The characters are: Of the *calyx* the universal umbel is manifold; the partial one short and crowded; the involucra are pinnatifid, with numerous leaflets: The *corollæ* are radiated, and all hermaphrodite: The *stamina* consist of five capillary filaments; the antheræ roundish: The *pistillum* has a germen beneath: the styli are two, and reflected; and the stigmata are obtuse: There is no *pericarpium*; the fruit is roundish, polished, striated, small, and partible: The *seeds* are two, plano-convex, and striated. Of this there are three

Species. 1. The majus, or common bishop's-weed, the seeds of which are used in medicine. The glaucifolium, with all its leaves cut in the shape of a spear. 3. The copticum, or Egyptian bishop's-weed.

Culture, &c. The first is an annual plant; and therefore is to be propagated by seeds sown in the autumn, in the place where the plants are to remain. They will flower in June, and the seeds will ripen in August. This plant will grow in any open situation, but thrives best in a light sandy soil. The second sort is perennial, and very hardy. It thrives best in a moist soil, and may be propagated by seeds in the same manner as the former.

The third species is now no otherwise known than by the figure of its seeds, which were formerly used in medicine, but have long since given place to those of the common kind. The seeds of the ammi-copticum are small, striated, of a reddish brown colour, and have a warm pungent taste, and a pleasant smell approaching to that of origanum. They are recommended as stomachic, carminative, and diuretic; but have long been strangers to the shops. The seeds of the ammi-majus, which are used in their place, are much weaker both in taste and smell, and without the origanum flavour of the other.

AMMIANUS (Marcellinus), a Grecian and a soldier as he calls himself, was born at Antioch, and flourished under Constantius and the preceeding emperors as late as Theodosius. He served under Julian in the east; and wrote in Latin an interesting history, from the reign of Nerva to the death of Valens, in 31 books of which only 18 remain. Though a Pagan, he speaks with candour and moderation of the Christian religion, and even praises it: his hero is the emperor Julian. He died about the year 390. The best edition of his history is that of Gronovius, in 1693.

AMMIRATO (Scipio), an eminent Italian historian, born at Lecca in Naples in 1531. After travelling over great part of Italy, without settling to his satisfaction, he was engaged by the great duke of Tuscany to write *The History of Florence*; for which he was presented to a canonry in the cathedral there. He wrote other works while in this station; and died in 1600.

AMMOCHRYSOS, from αμμος, *sand*, and χρυσος, *gold*; a name given by authors to a stone very common in Germany, and seeming to be composed of a golden sand. It is of a yellow gold-like colour, and its particles are very glossy, being all fragments of a coloured talc. It is usually so soft as to be easily rubbed to a powder in the hand; sometimes it requires grinding to powder in a mortar, or otherwise. It is used only as sand to strew over writing. The Germans call it *katzengold*. There is another kind of it, less common, but much more beautiful, consisting of the same sort of glossy spangles, but those not of a gold colour, but of a bright red, like vermilion.

AMMODYTES, or SAND-EEL, in ichthyology, a genus of fishes belonging to the order of apodes. This fish resembles an eel, and seldom exceeds a foot in length. The head of the ammodytes is compressed and narrower than the body; the upper jaw is larger than the under; the body is cylindrical, with scales hardly perceptible. There is but one species of the ammodytes, viz. the tobianus, or launce, a native of Europe. This fish gathers itself into a circle, and pierces the sand with its head in the centre. It is found in most of the sandy shores during some of the summer-months; it conceals itself, on the recess of the tides, beneath the sand, in such places where the water is left, at the depth of about a foot; and is in some places dug out, in others drawn up by means of a hook contrived for that purpose. They are commonly used as baits for other fish, but they are also very delicate eating. These fish are found in the stomach of the *Porpess*; an argument that the last roots up the sand with its nose, as the hogs do the ground.

AMMON, anciently a city of Marmarica (Ptolemy). Arrian calls it a *place*, not a city, in which stood the temple of Jupiter Ammon, round which there was nothing but sandy wastes. Pliny says, That the oracle of Ammon was 12 days journey from Memphis, and among the *Nomi* of Egypt he reckons the *Nomos Ammoniacus*: Diodorus Siculus, That the district where the temple stood, though surrounded with desarts, was watered by dews which fell nowhere else in all that country. It was agreeably adorned with fruitful trees and springs

Ammon. springs, and full of villages. In the middle stood the acropolis or citadel, encompassed with a triple wall; the first and inmost of which contained the palace; the others the apartments of the women, the relations and children, as also the temple of the god, and the sacred fountain for lustrations. Without the acropolis stood, at no great distance, another temple of Ammon, shaded by a number of tall trees: near which there was a fountain, called that of the sun, or *Solis Fons*, because subject to extraordinary changes according to the time of the day; morning and evening warm; at noon cold, at midnight extremely hot. A kind of fossil salt was said to be naturally produced here. It was dug out of the earth in large oblong pieces, sometimes three fingers in length, and transparent as crystal. It was thought to be a present worthy of kings, and used by the Egyptians in their sacrifices.—From this our sal-ammoniac has taken its name.

AMMON, or HAMMON, in heathen mythology, the name of the Egyptian Jupiter, worshipped under the figure of a ram.

Bacchus having subdued Asia, and passing with his army through the desarts of Africa, was in great want of water: but Jupiter, his father, assuming the shape of a ram, led him to a fountain, where he refreshed himself and his army; in gratitude for which favour, Bacchus built there a temple to Jupiter, under the title of *Ammon* from the Greek αμμος, which signifies *sand*, alluding to the sandy desart where it was built. In this temple was an oracle of great note, which Alexander the Great consulted, and which lasted till the time of Theodosius.

Hammon the god of the Egyptians, was the same with the Jupiter of the Greeks; for which reason these latter denominate the city which the Egyptians call No-Hammon, or the habitation of Ammon, *Diospolis*, or the city of Jupiter. He is thought to be the same with Ham, who peopled Africa, and was the father of Mizraim, the founder of the Egyptians.

AMMON, or BEN-AMMI, the son of Lot, begot by that patriarch upon his youngest daughter (Gen. xix. 38.) He was the father of the Ammonites, and dwelt to the east of the Dead Sea, in the mountains of Gilead. See AMMONITIS and AMMONITES.

AMMON (Andreas), an excellent Latin poet, born at Lucca in Italy, was sent by Pope Leo X. to England, in the characters of prothonotary of the Apostolic See, and collector-general of the kingdom. Being a man of singular genius and learning, he soon became acquainted with the principal literati of those times; particularly with Erasmus, Colet, Grocin, and others, for the sake of whose company he resided some time at Oxford. The advice which Erasmus gives him, in regard to pushing his fortune, has a good deal of humour in it, and was certainly intended as a satire on the artful methods generally practised by the selfish and ambitious part of mankind: "In the first place (says he), throw off all sense of shame; thrust yourself into every one's business, and elbow out whomsoever you can; neither love nor hate any one; measure every thing by your own advantage; let this be the scope and drift of all your actions. Give nothing but what is to be returned with usury, and be complaisant to every body. Have always two strings to your bow. Feign that you are solicited by many from abroad, and get every thing ready for your departure. Show letters inviting you elsewhere, with great promises." Ammon was Latin secretary to Henry VIII. but at what time he was appointed does not appear. In 1512 he was made canon and prebendary of the collegiate chapel of St Stephen, in the palace of Westminster. He was likewise prebendary of Wells; and in 1514 was presented to the rectory of Dychial in that diocese. About the same time, by the king's special recommendation, he was also made prebendary of Salisbury. He died in the year 1517, and was buried in St Stephen's chapel in the palace of Westminster. He was esteemed an elegant Latin writer, and an admirable poet. The epistles of Erasmus to Ammon abound with encomiums on his genius and learning.—His works are, 1. *Epistolæ ad Erasmum*, lib. 1. 2. *Scotici conflictus historia*, lib. 1. 3. *Bucolicæ vel eclogæ*, lib. 1. Brasil 1546. 4. *De rebus nihil*, lib. 1. 5. *Panegyricus quidam*, lib. 1. 6. *Varii generis epigrammata*, lib. 1. 7. *Poemata diversa*, lib. 1.

Ammoniac. AMMONIAC, a concrete gummy resinous juice, brought from the East-Indies, usually in large masses, composed of little lumps or tears, of a milky colour, but soon changing, upon being exposed to the air, of a yellowish hue. We have no certain account of the plant which affords this juice; the seeds usually found among the tears, resemble those of the umbelliferous class. It has been, however, alleged, and not without some degree of probability, that it is an exudation from a species of the FERULA, another species of which produces the assafœtida. The plant producing it is said to grow in Nubia, Abyssinia, and the interior parts of Egypt. It is brought to the western part of Europe from Egypt, and to England from the Red-Sea, by some of the ships belonging to the East-India Company trading to those parts. Such tears as are large, dry, free from little stones, seeds, or other impurities, should be picked out, and preferred for internal use: the coarser kind is purified by solution and colature, and then carefully inspissating it; unless this be artfully managed, the gum will lose a considerable deal of its more volatile parts. There is often vended in the shops, under the name of strained gum-ammoniacum, a composition of ingredients much inferior in virtue.

Ammoniac has a nauseous sweet taste, followed by a bitter one; and a peculiar smell, somewhat like that of galbanum, but more grateful: it softens in the mouth, and grows of a whiter colour upon being chewed. Thrown upon live coals, it burns away in flame: it is in some measure soluble in water and in vinegar, with which it assumes the appearance of milk; but the resinous part, amounting to about one half, subsides on standing.

Ammoniac is an useful deobstruent, and frequently prescribed for opening obstructions of the abdominal viscera, and in hysterical disorders occasioned by a deficiency of the menstrual evacuations. It is likewise supposed to deterge the pulmonary vessels; and proves of considerable service in some kinds of asthmas, where the lungs are oppressed by viscid phlegm: in this intention, a solution of gum-ammoniac in vinegar of squills proves a medicine of great efficacy, though not a little unpleasant. In long and obstinate cholics proceeding from viscid matter lodged in the intestines, this gummy resin has produced happy effects, after the purges and the

the common carminitives had been uſed in vain. Ammoniac is moſt commodiouſly taken in the form of pills; about a ſcruple may be given every night, or oftener. Externally, it ſoftens and ripens hard tumours: a ſolution of it in vinegar ſtands recommended by ſome for reſolving even ſchirrous ſwellings. A plaſter made of it and ſquill-vinegar is recommended by ſome in white ſwellings. A dilute mixture of the ſame is likewiſe rubbed on the parts, which are alſo fumigated with the ſmoke of juniper-berries. In the ſhops is prepared a ſolution of it in pennyroyal water called from its milky colour *lac-ammoniaci*. It is an ingredient alſo in the ſquill pills.

*Sal-*AMMONIAC, a volatile ſalt, of which there are two kinds, ancient and modern. The ancient ſort, deſcribed by Pliny and Dioſcorides, was a native ſalt, generated in thoſe large inns or caravanſeras where the crowd of pilgrims, coming from the temple of Jupiter Ammon, uſed to lodge; who, in thoſe parts, travelling upon camels, and thoſe creatures when in Cyrene, a province of Egypt, where that celebrated temple ſtood, urining in the ſtables, or (ſay ſome) in the parched ſands, out of this urine, which is remarkably ſtrong, aroſe a kind of ſalt, denominated ſometimes (from the temple) *Ammoniac*, and ſometimes (from the country) *Cyreniac*. Since the ceſſation of theſe pilgrimages, no more of this ſalt is produced there; and, from this deficiency, ſome ſuſpect there never was any ſuch thing: But this ſuſpicion is removed, by the large quantities of a ſalt, nearly of the ſame nature, thrown out by mount Ætna. The characters of the ancient ſal-ammoniac are, that it cools water, turns aqua-fortis into aqua-regia, and conſequently diſſolves gold.

The modern ſal-ammoniac is entirely factitious: for which, ſee CHEMISTRY-*Index*.

AMMONIAN PHILOSOPHY. See AMMONIUS.

AMMONITÆ, in natural hiſtory. See *Cornu Ammonis*.

AMMONITES, a people deſcended from Ammon the ſon of Lot. The Ammonites deſtroyed thoſe giants which they called Zamzummims (Deut. ii. 19—21.), and ſeized upon their country. God forbad Moſes, and by him the children of Iſrael (*id.* 19.), to attack the Ammonites; becauſe he did not intend to give their lands unto the Hebrews. Before the Iſraelites entered the land of Canaan, the Amorites had by conqueſt got great part of the countries belonging to the Ammonites and Moabites. This Moſes retook from the Amorites, and divided between the tribes of Gad and Reuben. In the time of Jephtha, the Ammonites declared war againſt the Iſraelites (Judges xi.) under pretence that they detained a great part of the country which had formerly been theirs before the Amorites poſſeſſed it. Jephtha declared, that as this was an acquiſition which the Iſraelites had made in a juſt war, and what they had taken from the Amorites, who had long enjoyed it by right of conqueſt, he was under no obligation to reſtore it. The Ammonites were not ſatisfied with this reaſon; wherefore Jephtha gave them battle and defeated them. The Ammonites and Moabites generally united whenever there was any deſign ſet a-foot of attacking the Iſraelites. After the death of Othniel (*id.* iii.), the Ammonites and Amalekites joined with Eglon king of Moab to oppreſs the Hebrews; whom they ſubdued and governed, for the ſpace of 18 years, till they were delivered by Ehud the Son of Gera, who ſlew Eglon king of Moab. Some time after this, the Ammonites made war againſt the Iſraelites, and greatly diſtreſſed them. But theſe were at laſt delivered by the hands of Jephtha; who having attacked the Ammonites, made a very great ſlaughter among them (chap. xi.). In the beginning of Saul's reign (1. Sam. xi.), Naaſh king of the Ammonites having ſat down before Jabeſh-gilead, reduced the inhabitants to the extremity of demanding a capitulation. Naaſh anſwered, that he would capitulate with them upon no other conditions than their ſubmitting every one to have his right eye plucked out, that ſo they might be made a reproach to Iſrael: but Saul coming ſeaſonably to the relief of Jabeſh, delivered the city and people from the barbarity of the king of the Ammonites. David had been the king of Ammon's friend; and, after the death of this prince, he ſent ambaſſadors to make his compliments of condolence to Hanun his ſon and ſucceſſor; who, imagining that David's ambaſſadors were come as ſpies to obſerve his ſtrength, and the condition of his kingdom, treated them in a very injurious manner (2 Sam. x. 4.). David revenged this indignity thrown upon his ambaſſadors, by ſubduing the Ammonites, the Moabites, and the Syrians, their allies. Ammon and Moab continued under the obedience of the kings David and Solomon; and, after the ſeparation of the ten tribes, were ſubject to the kings of Iſrael till the death of Ahab in the year of the world 3107. Two years after the death of Ahab, Jehoram his ſon, and ſucceſſor of Ahaziah, defeated the Moabites (2 Kings iii.): but it does not appear that this victory was ſo complete as to reduce them to his obedience. At the ſame time, the Ammonites, Moabites, and other people, made an irruption upon the lands belonging to Judah; but were forced back and routed by Jehoſhaphat (2 Chr. xx 1, 2.). After the tribes of Reuben, Gad, and the half-tribe of Manaſſeh, were carried into captivity by Tiglath-pileſer in the year 3264, the Ammonites and Moabites took poſſeſſion of the cities belonging to theſe tribes. Jeremiah (xlix. 1.) reproaches them for it. The ambaſſadors of the Ammonites were ſome of thoſe to whom this prophet (chap. xxvii. 2—4.) preſented the cup of the Lord's fury, and directed to make bonds and yokes for themſelves; exhorting them to ſubmit themſelves to Nebuchadnezzar, and threatening them, if they did not, with captivity and ſlavery. Ezekiel (xxv. 4—10.) denounces their entire deſtruction; and tells them that God would give them up to the people of the eaſt, who ſhould ſet their palaces in their country, ſo that there ſhould be no more mention of the Ammonites among the nations. It is believed that theſe misfortunes happened to the Ammonites in the fifth year after the taking of Jaruſalem, when Nebuchadnezzar made war againſt all the people that dwelt upon the confines of Judea, in the year of the world 3420.

It is alſo thought probable, that Cyrus gave the Ammonites and Moabites the liberty of returning into their own country, from whence they had been removed by Nebuchadnezzar: for we ſee them, in the place of their former ſettlement, expoſed to thoſe revolutions which were common to the people of Syria and Paleſtine; ſubjects ſometimes to the kings of Egypt, and at other times to the kings of Syria. We are told by Polybius, that Antiochus the Great took Rabboth,

both, or Philadelphia, their capital, demolished the walls, and put a garrison in it in 3806. During the persecutions of Antiochus Epiphanes, Josephus informs, that the Ammonites showed their hatred to the Jews, and exercised great cruelties against such of them as lived about their country. Justin Martyr says, That in his time there were still many Ammonites remaining; but Origen assures us, that when he was living they were known only under the general name of Arabians. Thus was the prediction of Ezekiel (xxv. 10) accomplished; who said that the Ammonites should be destroyed in such a manner as not to be remembered among the nations.

ANMONITIS (anc. geog.), a country of Arabia Petræa, occupied by the children of Ammon, whence the appellation. Its limits, partly to the west, and partly to the north, where the river Jabbok, whose course is no where determined; though Josephus says, that it runs between Rabbath-Ammon, or Philadelphia, and Gerasa, and falls into the Jordan.

AMMONIUS, firnamed SACCAS, was born in Alexandria, and flourished about the beginning of the third century. He was one of the most celebrated philosophers of his age; and, adopting with alterations the Ecclectic philosophy, laid the foundations of that sect which was distinguished by the name of new *New Platonics*. See ECCLECTICS and PLATONISM.

This learned man was born of Christian parents and educated in their religion; the outward profession of which, it is said, he never entirely deserted. As his genius was vast and comprehensive, so were his projects bold and singular: For he attempted a general coalition of all sects, whether philosophical or religious, by framing a system of doctrines which he imagined calculated to unite them all, the Christians not excepted, in the most perfect harmony. In pursuance of this design, he maintained, that the great principles of all philosophical and religious truth were to be found equally in all sects; that they differed from each other only in their method of expressing them, and in some opinions of little or no importance; and that, by a proper interpretation of their respective sentiments, they might easily be united into one body. Accordingly, all the Gentile religions, and even the Christian, were to be illustrated and explained by the principles of this universal philosophy; and the fables of the priests were to be removed from Paganism, and the comments and interpretations of the disciples of Jesus from Christianity. In conformity to this plan, he insisted, that all the religious systems of all nations should be restored to their original purity, and reduced to their primitive standard, viz. the ancient philosophy of the East, preserved uncorrupted by Plato: and he affirmed, that this project was agreeable to the intentions of Jesus Christ; whose sole view in descending upon earth was to set bounds to the reigning superstition, to remove the errors that had blended themselves with the religion of all nations, but not to abolish the ancient theology from which they were derived. He therefore adopted the doctrines which were received in Egypt concerning the universe and the Deity, considered as constituting one great whole; concerning the eternity of the world, the nature of souls, the empire of Providence, and the government of the world by dæmons. He also established a system of moral discipline; which allowed the people in generrl to live according to the laws of their country and the dictates of nature; but required the wise to exalt their minds by contemplation, and to mortify the body, so that they might be capable of enjoying the presence and assistance of the dæmons, and of ascending after death to the presence of the Supreme Parent. In order to reconcile the popular religions, and particularly the Christian, with this new system, he made the whole history of the Heathen gods an allegory; maintaining that they were only celestial ministers, intitled to an inferior kind of worship. And he acknowledged that Jesus Christ was an excellent man, and the friend of God; but alleged that it was not his design entirely to abolish the worship of dæmons, and that his only intention was to purify the ancient religion. This system, so plausible in its first rise, but so comprehensive and complying in its progress, has been the source of innumerable errors and corruptions in the Christian church. At its first establishment it is said to have had the approbation of Athenagoras, Pantænus, and Clemens the Alexandrian, and of all who had the care of the public school belonging to the Christians at Alexandria. It was afterwards adopted by Longinus the celebrated author of the treatise on the Sublime, Plotinus, Herennius, Origen, Porphyry, Jamblichus the disciple of Porphyry, Sopater, Edisius, Eustathius, Maximus of Ephesus, Priscus, Chrysanthius the master of Julian, Julian the Apostate, Hierocles, Proclus, and many others, both Pagans and Christians.

The above opinions of Ammonius are collected from the writings and disputations of his disciples, the modern Platonics; for he himself left nothing in writing behind him; nay, he imposed a law upon his disciples not to divulge his doctrines among the multitude; which injunction, however, they made no scruple to neglect and violate.

AMMONIUS, furnamed LITHOTOME, a celebrated surgeon of Alexandria; so called from his inventing the operation of extracting the stone from the bladder.

AMMUNITION, a general name for all warlike provisions; but more particularly powder, ball, &c.

Ammunition, arms, utensils of war, gun-powder, imported without licence from his Majesty, are, by the laws of England, forfeited, and triple the value. And again, such licence obtained, except for furnishing his Majesty's public stores, is to be void, and the offender to incur a premunire, and to be disabled to hold any office from the crown.

AMMUNITION Bread, Shoes, &c. such as are served out to the soldiers of an army or garrison.

AMNESTY, in matters of policy, denotes a pardon granted by a prince to his rebellious subjects, usually with some exceptions: such was that granted by Charles II. at his restoration.—The word is formed from the Greek αμνηστια, the name of an edict of this kind published by Thrasibulus, on his expulsion of the tyrants out of Athens.

AMNIOS, in anatomy, a thin pellucid membrane which surrounds the fœtus in the womb. See FOETUS.

AMOEBÆUM, in ancient poetry, a kind of poem repre-

representing a dispute between two persons, who are made to answer each other alternately; such are the third and seventh of Virgil's eclogues.

AMOL, a town of Asia, in the country of the Usbecks, seated on the river Gihon. E. Long. 64. 30. N. Lat. 39. 20.

AMOMUM, GINGER: A genus of the monogynia order, belonging to the monandria class of plants. The characters are: The *calyx* is an obscure three-toothed perianthium, above: The *corolla* is monopetalous, the tubus short, the limbus tripartite: The *stamina* is an oblong filament, with the antheræ adjoining: The *pistillum* has a roundish germen, beneath; the stylus is filiform, the stigma obtuse: The *pericarpium* is leathery, subovate, trigonous, trilocular, and three-valved: The *seeds* are numerous.—Of this genus there are four

Species. 1. The zingiber, or common ginger, is a native of the East, and also of some parts of the West Indies; where it grows naturally without culture. The roots are jointed, and spread in the ground: they put out many green reed-like stalks in the spring, which arise to the height of two feet and an half, with narrow leaves. The flower-stems arise by the side of these, immediately from the root; these are naked; ending with an oblong scaly spike. From each of these scales is produced a single blue flower, whose petals are but little lower than the squamous covering. 2. The zerumbet, or wild ginger, is a native of India. The roots are larger than those of the first, but are jointed in the same manner. The stalks grow from three to near four feet high, with oblong leaves placed alternately. The flower-stems arise immediately from the root: these are terminated by oblong, blunt, scaly heads; out of each scale is produced a single white flower, whose petals extend a considerable length beyond the scaly covering. 3. The cardamomum, or cardamom, is likewise a native of India; but is little known in Europe except by its seeds, which are used in medicine. Of this there is a variety, with smaller fruit, which makes the distinction into cardamomum majus and minus. The first, when it comes to us, is a dried fruit or pod about an inch long, containing, under a thick skin, two rows of small triangular seeds of a warm aromatic flavour. The cardamomum minus is a fruit scarce half the length of the foregoing, but considerably stronger both in smell and taste. 4. The grana paradisi species is likewise a native of the East Indies. The fruit containing the grains of paradise is about the size of a fig, divided into three cells, in each of which are contained two roots of small seeds like cardamoms. They are somewhat more grateful, and considerably more pungent, than cardamoms.

Culture. The first two species are tender, and require a warm stove to preserve them. They are easily propagated by parting the roots in the spring. These should be planted in pots filled with light rich earth, and plunged into a hot-bed of tanner's-bark, where they must constantly remain. If we may believe the Abbé Raynal, cardamoms propagate themselves, in those countries where they are natives, without either sowing or planting. Nothing more is required than, as soon as the rainy season is over, to set fire to the herb which has produced the fruit.

Uses. The dried roots of the first species are of great use in the kitchen, as well as in medicine. They furnish a considerable export from some of the American islands. The green roots, preserved as a sweet-meat, are preferable to every other kind. The Indians mix them with their rice, which is their common food, to correct its natural insipidity. This spice, mixed with others, gives the dishes seasoned with it a strong taste, which is extremely disagreeable to strangers. The Europeans, however, who come into Asia without fortunes, are obliged to conform to it. The others adopt it out of complaisance to their wives, who are generally natives of the country.—Ginger is a very useful spice, in cold flatulent colics, and in laxity and debility of the intestines; it does not heat so much as those of the pepper kind, but its effects are much more durable. The cardamoms and grains of paradise have the same medicinal qualities with ginger.—In Jamaica, the common people employ it in baths and fomentations with good success, in complaints of the viscera, in pleurisies, and in obstinate and continued fevers.

AMOMUM Verum, or *True Amomum*, is a round fruit, about the size of a middling grape; containing, under a membranous cover, a number of small rough angular seeds, of a blackish brown colour on the outside, and whitish within: the seeds are lodged in three distinct cells; those in each cell are joined closely together, so as that the fruit, upon being opened, appears to contain only three seeds. Ten or twelve of these fruits grow together in a cluster; and adhere without any pedicle, to a woody stalk about an inch long; each single fruit is surrounded by six leaves, in form of a cup; and the part of the stalk void of fruit is clothed with leafy scales.—The husks, leaves, and stems, have a light grateful smell, and a moderately warm aromatic taste: the seeds, freed from the husks, are in both respects much stronger; their smell is quick and penetrating, their taste pungent, approaching to that of camphor. Notwithstanding amomum is an elegant aromatic, it has long been a stranger to the shops.

AMOMUM Vulgare. See SISON.

AMONTONS (William), an ingenious experimental philosopher, was born at Paris in 1663. While he was at the grammar-school, he by sickness contracted a deafness that almost excluded him conversation. In this situation, he applied himself to mechanics and geometry; and, it is said, refused to try any remedy for his disorder, either because he deemed it incurable, or because it increased his attention. He studied the nature of barometers and thermometers with great care; and wrote *Observations and Experiments concerning a new Hour-glass, and concerning Barometers, Thermometers, and Hygroscopes*; which, with some pieces in the Journal des Sçavans, are all his literary works. When the Royal academy was new-regulated in 1699 he was admitted a member; and read his *new Theory of Friction*, in which he happily cleared up an important object in mechanics. He died in 1705.

AMORÆANS, a sect or order of gemaric doctors, or commentators on the Jerusalem Talmud. The Amoræans succeeded the Mischnic doctors. They subsisted 250 years; and were succeeded by the Seburæans.

AMORGOS, or Amurgus (anc. geog.), now *Morgo*, not far from Naxus to the east, one of the European Sporades; the country of Simonides the Iambic poet. To this island criminals were banished. It was famous for a fine flax called *Emorgis*.

AMORITES, a people descended from Amorrhæus, according to the Septuagint and Vulgate; Emoræus, according to other expositors; Hæmori, according to the Hebrew; or Emorite, according to our version of the Bible; who was the fourth son of Canaan, Gen. x. 16.

The Amorites first of all peopled the mountains lying to the west of the Dead Sea. They had likewise establishments to the east of the same sea, between the brooks of Jabbock and Arnon, from whence they forced the Ammonites and Moabites. Num. xiii. 30. xxi. 29. Josh. v. 1. and Judges xi. 19, 20. Moses made a conquest of this country from their kings Sihon and Og, in the year of the world 2553.

The prophet Amos (ii. 9.), speaking of the gigantic stature and valour of the Amorites, compares their height with that of cedars, and their strength with that of an oak. The name Amorite is often taken in Scripture for all Canaanites in general. The lands which the Amorites possessed on this side Jordan were given to the tribe of Judah, and those which they had enjoyed beyond this river were distributed between the tribes of Reuben and Gad.

AMORIUM, a town of Phrygia Major, near the river Sangarius, on the borders of Galatia.—It was taken from the Romans by the Saracens in 668; but soon after retaken by the Romans.—A war breaking out again between these two nations in 837, the Roman emperor Theophylus destroyed Sozopetra the birth-place of the khalif Al' Motasem, notwithstanding his earnest intreaties to him to spare it. This so enraged the khalif, that he ordered every one to engrave upon his shield the word *Amorium*, the birthplace of Theophylus, which he resolved at all events to destroy. Accordingly he laid siege to the place, but met with a vigorous resistance. At length, after a siege of 55 days, it was betrayed by one of the inhabitants who had abjured the Christian religion. The khalif, exasperated at the loss he had sustained during the siege, put most of the men to the sword, carried the women and children into captivity, and levelled the city with the ground. His forces being distressed for want of water on their return home, the Christian prisoners rose upon some of them, and murdered them; upon which the khalif put 6000 of the prisoners to death.—According to the eastern historians, 30,000 of the inhabitants of Amorium were slain, and as many carried into captivity.

AMORPHA, False Indigo: A genus of the decandria order, belonging to the diadelphia class of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The characters are: The *calyx* is a single-leaved perianthium, tubular and persistent: The *corolla* consists of an ovate, concave, erect petal, scarcely larger than, and placed on the upper side of the calyx: The *stamina* consist of ten erect unequal filaments, longer than the corolla; the antheræ are simple: The *pistillum* has a roundish germen; the stylus subulated, and the length of the stamina; the stigma simple: The *pericarpium* is a lunated unilocular legumen, reflected, larger than the calyx, and tuburculated: The *seeds* are two, and kidney-shaped. By the corolla alone this genus may be distinguished from all the known plants in the universe: The petals are the banner; the wings and keel are wanting, which is very singular in a papilionaceous corolla.

Of this there is only one known species, a native of Carolina, where the inhabitants formerly made from it a coarse kind of indigo, whence the plant took its name. It rises, with many irregular stems, to the height of 12 or 14 feet. The leaves are late in the spring before their foliage is fully displayed. The ends of their branches are generally destroyed by the frost; or, if they recover it, they have the appearance of being dead; whilst other plants testify the effects of the reviving months. But, notwithstanding these defects, this tree has some other good properties that in part make amends for them. The leaves, when out, are admired by all. They are of a pleasant green colour; are very large, beautifully pinnated, the folioles being arranged along the stalk by pairs, and terminate by an odd one. The flowers are of a purple colour; they grow in spikes, seven or eight inches long, at the ends of the branches, and are of a singular structure. In order to make this tree have its best effect, it should be planted among others of its own growth, in a well-sheltered situation; by which means the ends will not be so liable to be destroyed by the winter's frosts; the branches will not suffer by the violence of the winds; and, as it is subject to put out many branches near the root, these indelicacies and imperfections will be concealed; whilst the tree will show itself to the utmost advantage when in blow, by elevating its purple-spiked flowers amongst the others in a pleasing view.

Culture. The amorpha is most readily propagated by seeds. It may also be propagated by laying down the young branches, which in one year will make good roots; and may then be taken off, and planted either in the nursery, or in the places where they are designed to remain. If they are put into a nursery, they should not remain there more than one year; for as the plants make large shoots, they do not remove well when they have remained long in a place.

AMORTIZATION, in law, the alienation of lands or tenements to a corporation or fraternity, and their successors. See Mortmain.

AMOS, the fourth of the small prophets, who in his youth had been a herdsman in Tekoa, a small town about four leagues southward of Jerusalem, was sent to the kine of Bashan, that is, to the people of Samaria, or the the kingdom of Israel, to bring them back to repentance, and an amendment of their lives; whence it is thought probable that he was born within the territories of Israel, and only retired to Tekoa on his being driven from Bethel, by Amaziah the priest of the golden calves at Bethel.

The prophet being thus retired to Tekoa, in the kingdom of Judah, continued to prophesy. He complains in many places of the violence offered him, by endeavouring to oblige him to silence. He boldly remonstrates against the crying sins that prevailed among the Israelites, as idolatry, oppression, wantonness, and obstinacy.

obstinacy. He likewise reproves those of Judah, such as their carnal security, sensuality, and injustice. He terrifies them both with frequent threatenings, and pronounces that their sins will at last end in the ruin of Judah and Israel, which he illustrates by the visions of a plumb-line and a basket of summer-fruit. It is observable in this prophecy, that as it begins with denunciation of judgment and destruction against the Syrians, Philistines, Tyrians, and other enemies of the Jews, so it concludes with comfortable promises of restoring the tabernacle of David, and erecting the kingdom of Christ. Amos was chosen to the prophetic office in the time of Uzziah king of Judah, and Jeroboam the son of Joash, king of Israel, two years before the earthquake (Amos i. 1.), which happened in the 24th or 25th year of Uzziah, according to the rabbins and most of the modern commentators; or the year of the world 3219, when this prince usurped the priest's office, and attempted to offer incense to the Lord: but it is observed, that this cannot be the case, because Jotham, the son of Uzziah, who was born in 3221, was of age to govern, and consequently was between 15 and 20 years of age, when his father undertook to offer incense, and was struck with a leprosy. The first of the prophecies of Amos, in order of time, are those of the 7th chapter: the rest he pronounced in the town of Tekoa, whither he retired. He foretold the misfortunes which the kingdom of Israel should fall into after the death of Jeroboam II. who was then living; he foretold the death of Zechariah, the invasion of the lands belonging to Israel by Phul and Tiglath-pileser kings of Assyria; and he speaks of the captivity of the ten tribes, and their return.

The time and manner of this prophet's death are not known. Some old authors relate that Amaziah, priest of Bethel, provoked by the discourses of the prophet, had his teeth broke in order to silence him. Others say, that Hosea or Uzziah, the son of Amaziah, struck him with a stake upon the temples, knocked him down, and wounded him much; in which condition he was carried to Tekoa, where he died, and was buried with his fathers; but it is generally thought that he prophesied a long time at Tekoa, after the adventure which he had with Amaziah; and the prophet himself taking no notice of the ill treatment which he is said to have received, is an argument that he did not suffer in the manner they relate.

St Jerom observes, that there is nothing great or sublime in the style of Amos. He applies the words of St Paul (2 Cor. xi. 6.) to him, 'rude in speech though not in knowledge.' And he farther observes, that he borrows his comparison from the state and profession to which he belonged.

AMOY, an island in the province of Fokien, in China, Long. 136. 0. Lat. 24. 30. It has a fine port that will contain many thousand vessels. The emperor has a garrison of here 7000 men.

AMPELIS, the vine, in botany. See VITIS.

AMPELIS, the *Chatterer*, in zoology, a genus of birds belonging to the order of passeres; the distinguishing characters of which are, that the tongue is furnished with a rim or margin all round, and the bill is conical and strait. There are seven species all natives of foreign countries, except the garrulus, which is a native both of Europe and of West Indies. In the former, the native country of these birds is Bohemia: from whence they wander over the rest of Europe, and were once superstitiously considered as presages of a pestilence. They appear annually about Edinburgh in February; and feed on the berries of the mountain-ash. They also appear as far south as Northumberland; and, like the field-fare, make the berries of the white-thorn their food. It is but by accident that they ever appear farther south. They are gregarious; feed on grapes, where vineyards are cultivated; are easily tamed; and are esteemed delicious food. This species is about the size of the black-bird: the bill is short, thick, and black; on the head is a sharp pointed crest reclining backwards: the lower part of the tail is black; the end of a rich yellow; the quill-feathers are black, the three first tipt with white; the six next have half an inch of their exterior margin edged with fine yellow, the interior with white. But what distinguishes this from all other birds, are the horny appendages from the tips of seven of the secondary feathers, of the colour and gloss of the best red wax.

AMPELITES, CANNEL-COAL, or CANDLE-COAL, a hard, opaque, fossile, inflammable substance, of a black colour. It does not effervesce with acids. The ampelites, though much inferior to jet in many respects, is yet a very beautiful fossile; and, for a body of so compact a structure, remarkably light. Examined by the miscroscope, it appears composed of innumerable very small and thin plates laid closely and firmly on one another; and full of very small specks of a blacker and more shining matter than the rest, which is evidently a purer bitumen than the general mass. These specks are equally diffused over the different parts of the masses. There is a large quarry of it near Alençon in France. It is dug in many parts of England, but the finest is in Lancashire and Cheshire; it lies usually at considerable depths. It makes a very brisk fire, flaming violently for a short time, and after that continuing red and glowing hot a long while; and finally is reduced into a small proportion of grey ashes, the greater part of its substance having flown off in the burning.—It is capable of a very high and elegant polish; and, in the countries where it is produced, is turned into a vast number of toys, as suff-boxes and the like, which bear all the nicety of turning, and are made to pass for jet.—Husbandmen smear their vines with it, as it kills the vermin which infests them. It is likewise used for the dyeing of hair black. In medicine it is reputed good in colics, against worms, and of being in general an emollient and discutient; but the present practice takes no notice of it.

AMPELUSIA, (anc. geog.) a promontory of Mauritania Tingitana, called *Cottes* by the natives, which is of the same signification with a town of the same name not far from the River Lixus, near the straits of Gibraltar: now *Cape-Spartel*. W. Long. 6. 30. N. Lat. 36. 0.

AMPHERES, in antiquity, a kind of vessels wherein the rowers plied two oars at the same time, one with the right hand and the other with the left.

AMPHIATHROSIS, in anatomy, a term for such junctures of bones as have an evident motion, but different from the diathrosis, &c. See DIATHROSIS.

AMPHIARAUS, in pagan mythology, a celebrated prophet, who possessed part of the kingdom of Argos.

Amphibia. gos. He was believed to excel in divining by dreams, and is said to be the first who divined by fire. Amphiaraus knowing, by the spirit of prophecy, that he would lose his life in the war against Thebes, hid himself in order to avoid engaging in that expedition; but, his wife Eriphyle, being prevailed upon by a present, discovered the place in which he had concealed himself; so that he was obliged to accompany the other princes who marched against Thebes. This proved fatal to him; for the earth being split asunder by a thunder-bolt, both he and his chariot were swallowed up in the opening.—Amphiaraus, after his death, was ranked among the gods; temples were dedicated to him; and his oracle, as well as the sports instituted to his honour, were very famous.

AMPHIBIA, in zoology, the name of Linnæus's third class of animals; including all those which live partly in water and partly on land. This class he subdivides into four orders, *viz.* The amphibia reptiles; the amphibia serpentes; the amphibia nantes; and the amphibia meantes. See ZOOLOGY.

It has been a question whether the animals commonly called *amphibious*, live most in the water or on land. If we consider the words αμφι (*utrinque*, both ways), and βιος (*vita* life), from whence the term *amphibious* is derived; we should understand, that animals, having this title, should be capable of living as well by land, or in the air, as by water; or of dwelling in either constantly at will: but it will be difficult to find any animal that can fulfil this definition, as being equally qualified for either. An ingenious naturalist,* therefore, from considering their œconomy respectively, divides them into two orders, *viz.* 1. Such as enjoy their chief functions by land, but occasionally go into the water. 2. Such as chiefly inhabit the water, but occasionally go ashore. What he advances on this subject is curious, and well illustrates the nature of this class.

* Dr *Parson's*; in a paper read before the Royal Society.

1. Of the first order, he particularly considers the phocæ; and endeavours to show, that none of them can live chiefly in the water, but that their chief enjoyment of the functions of life is on shore.

These animals (he observes) are really quadrupeds†; but as their chief food is fish, they are under a necessity of going out to sea to hunt their prey, and to great distances from shore; taking care that, however great the distance, rocks or small islands are at hand, as resting-places when they are tired, or when their bodies become too much macerated in the water; and they return to the places of their usual resort to sleep, copulate, and bring forth their young, for the following reasons, viz. It is well known, that the only essential difference (as to the general structure of the heart) between amphibious and mere land animals, or such as never go into the water, is, that in the former, the oval hole remains always open. Now, in such as are without this hole, if they were to be immersed in water for but a little time, respiration would cease, and the animal must die; because a great part of the mass of blood passes from the heart by the pulmonary artery through the lungs, and by the pulmonary veins returns to the heart, while the aorta is carrying the greater part of the mass to the head and extremities, &c.

† See the article *Phoca.*

Now, the blood passes through the lungs in a continual uninterrupted stream, while respiration is gentle and moderate: but when it is violent, then the circulation is interrupted, for inspiration and exspiration are now carried to their extent; and in this state the blood cannot pass through the lungs either during the total inspiration or total exspiration of the air in breathing: for, in the former case, the inflation compresses the returning veins; and, in the latter, by the collapsion of the lungs, these veins are interrupted also; so that it is only between these two violent actions that the blood can pass: and hence it is, that the lives of animals are shortened and their health impaired, when they are subjected to frequent violent respiration; and thus it is, that when animals have once breathed, they must continue to respire ever after, for life is at an end when that ceases.

There are three necessary and principal uses of respiration in all land-animals, and in those kinds that are counted amphibious.—The first is that of promoting the circulation of the blood through the whole body and extremities. In real fishes, the force of the heart is alone capable of sending the blood to every part, as they are not furnished with limbs or extremities; but in the others mentioned, being all furnished with extremities, respiration is an assistant force to the arteries in sending blood to the extremities; which, being so remote from the heart, have need of such assistance, otherwise the circulation would be very languid in these parts: thus we see, that in persons subject to asthmatic complaints, the circulation grows languid, the legs grow cold and eodematous, and other parts suffer by the defect in respiration.—A second use of breathing is, that, in inspiration, the variety of particles, of different qualities, which float always in the air, might be drawn into the lungs, to be insinuated into the mass of blood, being highly necessary to contemperate and cool the agitated mass, and to contribute refined pabulum to the finer parts of it, which, meeting with the daily supply of chyle, serves to assimilate and more intimately mix the mass, and render its constitution the fitter for supporting the life of the animal. Therefore it is, that valetudinarians, by changing foul, or unwholesome air, for a free, good, open air, often recover from lingering diseases.—A third principal use of respiration is, to promote the exhibition of voice in animals; which all those that live on the land do according to their specific nature.

From these considerations it appears, that the phocæ of every kind are under an absolute necessity of making the land their principal residence. But there is another very convincing argument why they reside on shore the greatest part of their time; namely, that the flesh of these creatures is analogous to that of other land animals: and therefore, by over-long maceration, added to the fatigue of their chasing their prey, they would suffer such a relaxation as would destroy them. It is well known, that animals which have lain long under water, are reduced to a very lax and even putrid state; and the phoca must bask in the air on shore: for while the solids are at rest, they acquire their former degree of tension, and the vigour of the animal is restored; and while he has an uninterupted placid respiration, his blood is refreshed by the new supply of air, as explained above, and he is rendered fit for his next cruise: for action wastes the most exalted fluids of the body, more or less, according to its duration and violence; and the restorative rest must continue a longer er or ſhorter time, according to the quantity of the previous fatigue.

Let us now examine by what power theſe animals are capable of remaining longer under water than land-animals.

All theſe have the oval hole open between the right and left auricles of the heart; and, in many, the canalis arterioſus alſo: and while the phoca remains under water, which he may continue an hour or two more or leſs, his reſpiration is ſtopped; and the blood, not finding the paſſage through the pulmonary artery free, ruſhes through the hole from the right to the left auricle, and partly through the arterial canal, being a ſhort paſſage to the aorta, and thence to every part of the body, maintaining the circulation; but, upon riſing to come aſhore, the blood finds its paſſage again thro' the lungs the moment he reſpires.

Thus the fœtus in utero, during its confinement, having the lungs compreſſed, and conſequently the pulmonary arteries and veins impervious, has the circulation of the blood carried on through the oval hole and the arterial canal. Now, ſo far the phoca in the water, and the fœtus in utero, are analogous; but they differ in other material circumſtances. One is, that the fœtus having never reſpired, remains ſufficiently nouriſhed by the maternal blood circulating through him, and continues to grow till the time of his birth, without any want of reſpiration during nine months confinement; the phoca, having reſpired the moment of his birth, cannot live very long without it, for the reaſons given before; and this hole and canal would be cloſed in them, as it is in land-animals, if the dam did not, ſoon after the birth of the cub, carry him ſo very frequently into the water to teach him; by which practice theſe paſſages are kept open during life, otherwiſe they would not be capable of attaining the food deſigned for them by Providence.

Another difference is, that the phoca, as was ſaid before, would be relaxed by maceration in remaining too long in the water; whereas the fœtus in utero ſuffers no injury from continuing its full number of months in the fluid it ſwims in: the reaſon is, that water is a powerful ſolvent, and penetrates the pores of the ſkins of land-animals, and in time can diſſolve them; whereas the *liquor amnii* is an inſipid ſoft fluid, impregnated with particles more or leſs mucilaginous, and utterly incapable of making the leaſt alteration in the cutis of the fœtus.

Otters, beavers, and ſome kinds of rats, go occaſionally into the water for their prey, but cannot remain very long under water. "I have often gone to ſhoot otters (ſays our author), and watched all their motions: I have ſeen one of them go ſoftly from a bank into the river, and dive down; and in about two minutes riſe, at 10 or 15 yards from the place he went in, with a middling ſalmon in his mouth, which he brought on ſhore. I ſhot him, and ſaved the fiſh whole." Now, as all fœtuſes have theſe paſſages open, if a whelp of a true water-ſpaniel was, immediately after its birth, ſerved as the phoca does her cubs, and immerſed in water, to ſtop reſpiration for a little time every day, it is probable that the hole and canal would be kept open, and the dog be made capable of remaining as long under water as the phoca.

Frogs, how capable ſoever of remaining in the water, yet cannot avoid living on land, for they reſpire; and if a frog be thrown into a river, he makes to the ſhore as faſt as he can.

The lizard kind, ſuch as may be called water-lizards (ſee LACERTA), are all obliged to come to land, in order to depoſite their eggs, to reſt, and to ſleep. Even the crocodiles, who dwell much in rivers, ſleep and lay their eggs on ſhore; and, while in the water, are compelled to riſe to the ſurface to breathe; yet, from the texture of his ſcaly covering, he is capable of remaining in the water longer by far than any ſpecies of the phoca, whoſe ſkin is analogous to that of a horſe or cow.

The hippopotamus (See HIPPOPOTAMUS), who wades into the lakes or rivers, is a quadruped, and remains under the water a conſiderable time; yet his chief reſidence is upon land, and he muſt come on ſhore for reſpiration.

The teſtudo, or ſea tortoiſe (ſee TESTUDO), though he goes out to ſea, and is often found far from land; yet, being a reſpiring animal, cannot remain long under water. He has indeed a power of rendering himſelf ſpecifically heavier or lighter than the water, and therefore can let himſelf down to avoid an enemy or a ſtorm: yet he is under a neceſſity of riſing frequently to breathe, for reaſons given before; and his moſt uſual ſituation, while at ſea, is upon the ſurface of the water, feeding upon the various ſubſtances that float in great abundance every where about him; theſe animals ſleep ſecurely upon the ſurface, but not under water; and can remain longer at ſea than any other of this claſs, except the crocodile, becauſe, as it is with the latter, his covering is not in danger of being too much macerated; yet they muſt go on ſhore to copulate and lay their eggs.

2. The conſideration of theſe is ſufficient to inform us of the nature of the firſt order of the claſs of amphibious animals; let us now ſee what is to be ſaid of the ſecond in our diviſion of them, which are ſuch as chiefly inhabit the waters, but occaſionally go on ſhore.

Theſe are but of two kinds: the eels, and water ſerpents or ſnakes of every kind. It is their form that qualifies them for loco-motion on land, and they know their way back to the water at will; for by their ſtructure they have a ſtrong periſtaltic motion, by which they can go forward at a pretty good rate: whereas all other kinds of fiſh, whether vertical or horizontal, are incapable of a voluntary loco-motion on ſhore; and therefore, as ſoon as ſuch fiſh are brought out of the water, after having flounced a while, they lie motionleſs, and ſoon die.

Let us now examine into the reaſon why theſe vermicular fiſh, the eel and ſerpent kinds, can live a conſiderable time on land, and the vertical and horizontal kinds die almoſt immediately when taken out of the water: and, in this reſearch, we ſhall come to know what analogy there is between land animals and thoſe of the waters. All land-animals have lungs, and can live no longer than while theſe are inflated by the ambient air, and alternately compreſſed for its expulſion; that is, while reſpiration is duly carried on, by a regular inſpiration and exſpiration of air.

In like manner, the fiſh in general have, inſtead of lungs, gills or branchiæ: and as in land-animals the lungs have a large portion of the maſs of blood circulating through them, which muſt be ſtopped if the air has

has not a free ingreſs and egreſs into and from them; ſo, in fiſh, there is a great number of blood-veſſels that paſs through the branchiæ, and a great portion of their blood circulates through them, which muſt in like manner be totally ſtopped, if the branchiæ are not perpetually wet with water. So that, as the air is to the lungs in land-animals a conſtant aſſiſtant to the circulation; ſo is the water to the branchiæ of thoſe of the rivers and ſeas: for when theſe are out of the water, the branchiæ very ſoon grow criſp and dry, the blood-veſſels are ſhrunk, and the blood is obſtructed in its paſſage; ſo when the former are immerſed in water, or otherwiſe prevented from having reſpiration, the circulation ceaſes and the animal dies.

Again, as land-animals would be deſtroyed by too much maceration in water; ſo fiſhes would, on the other hand, be ruined by too much exſiccation; the latter being from their general ſtructure and conſtitution, made fit to bear, and live in, the water; the former, by their conſtitution and form, to breathe and dwell in the air.

But it may be aſked, why eels and water-ſnakes are capable of living longer in the air than the other kinds of fiſh? This is anſwered, by conſidering the providential care of the great Creator for theſe and every one of his creatures: for ſince they were capable of locomotion by their form, which they need not be if they were never to go on ſhore, it ſeemed neceſſary that they ſhould be rendered capable of living a conſiderable time on ſhore, otherwiſe their loco-motion would be in vain. How is this provided for? Why, in a moſt convenient manner; for this order of fiſhes have their branchiæ well covered from the external drying air; they are alſo furniſhed with a ſlimy mucus, which hinders their becoming criſp and dry for many hours; and their very ſkins always emit a mucous liquor, which keeps them ſupple and moiſt for a long time: whereas the branchiæ of other kinds of fiſh are much expoſed to the air, and want the ſlimy matter to keep them moiſt. Now, if any of theſe, when brought out of the water, were laid in a veſſel without water, they might be preſerved alive a conſiderable time, by only keeping the gills and ſurface of the ſkin conſtantly wet, even without any water to ſwim in.

It has been advanced, that *man* may, by art, be rendered amphibious, and able to live under water as well as frogs. As the fœtus lives *in utero* without air, and the circulation is there continued by means of the foramen ovale; by preſerving the paſſage open, and the other parts *in ſtatu quo*, after the birth, the ſame faculty would ſtill continue. Now, the foramen, it is alleged, would be preſerved in its open ſtate, were people accuſtomed, from their infancy, to hold their breath a conſiderable time once a-day, that the blood might be forced to reſume its priſtine paſſage, and prevent its drying up as it uſually does. This conjecture ſeems, in ſome meaſure, ſupported by the practice of divers, who are taught from their childhood to hold their breath, and keep long under water, by which means the ancient channel is kept open.—A Calabrian monk at Madrid laid claim to this amphibious capacity, making an offer to the king of Spain, to continue twice twenty-four hours under Water, without ever coming up to take breath. Kircher gives an account of a Sicilian, named the *fiſh Colas*, who, by a long habitude from his youth, had ſo accuſtomed himſelf to live in water, that his nature ſeemed to be quite altered; ſo that he lived rather after the manner of a fiſh than a man.

AMPHIBOLOGY, in grammar and rhetoric, a term uſed to denote a phraſe ſuſceptible of two different interpretations. Amphibology ariſes from the order of the phraſe, rather than from the ambiguous meaning of a word.

Of this kind was that anſwer which Pyrrhus received from the oracle: *Aio te, Æacida, Romanos vincere poſſe;* where the amphibology conſiſts in this, that the words *te* and *Romanos*, may either of them precede, or either of them follow, the words *poſſe vincere*, indifferently. See Oracle.

The Engliſh language uſually ſpeaks in a more natural manner, and is not capable of any amphibologies of this kind: nor is it ſo liable to amphibologies in the articles, as the French and moſt other modern tongues.

AMPHIBRACHYS, in ancient poetry, the name of a foot conſiſting of three ſyllables, whereof that in the middle is long, and the other two ſhort; ſuch is the word [ăbīrĕ].

AMPHICOME, in natural hiſtory, a kind of figured ſtone, of a round ſhape, but rugged, and beſet with eminences, celebrated on account of its uſe in divination. The word is originally Greek αμφικομη, *q. d. utrinque comata*, or "hairy on all ſides." This ſtone is alſo called *Erotylos*, Ερωτυλος, *Amatoria*, probably on account of its ſuppoſed power of creating love. The amphicome is mentioned by Democritus and Pliny, though little known among the moderns. Mercatus takes it for the ſame with the *lapis lumbricatus*, of which he gives a figure.

AMPHICTYONS, in Grecian antiquity, an aſſembly compoſed of deputies from the different ſtates of Greece: and reſembling, in ſome meaſure, the diet of the German empire. Some ſuppoſe the word Αμφικτιονες to be formed of αμφι, "about," and κτιειν or κτιζειν, in regard the inhabitanss of the country around about met here in council: others, with more probability, from *Amphictyon*, ſon of Deucalion, whom they ſuppoſe to have been the founder of this aſſembly; though others, will have Acriſius, king of the Argives, to have been the firſt who gave a form and laws to it.

Authors give different accounts of the number of the Amphictyons, as well as of the ſtates who were entitled to have their repreſentatives in this council. According to Strabo, Harpocration, and Suidas, they were twelve from their firſt inſtitution, ſent by the following cities and ſtates; the Ionians, Dorians, Perrhæbians, Bœotians, Magneſians, Achæans, Phthians, Melians, Dolopians, Ænianians, Delphians, and Phocians. Æſchines reckons no more than eleven; inſtead of the Achæans, Ænianians, Delphians, and Dolopians, he only gives the Theſſalians, Oetians, and Locrians. Laſtly, Pauſanias's liſt contains only ten, viz. the Ionians, Dolopians, Theſſalians, Ænianians, Magneſians, Melians, Phthians, Dorians, Phſcians, and Locrians.

In the time of Philip of Macedon, the Phocians were excluded the alliance, for having plundered the Delphian temple, and the Lacedæmonians were admitted in their place; but the Phocians, 60 years after, having behaved gallantly againſt Brennus and his Gauls, were reſtored to their ſeat in the Amphictyonic council.

admitted into the body; and to make room for it, the Magnesians, Melians, Phthians, and Ænianians, who till then had distinct voices, were ordered to be numbered with the Thessalians, and to have only one common representative. Strabo speaks as if this council were extinct in the times of Augustus and Tiberius: but Pausanias, who lived many years after, under Antoninus Pius, assures us it remained entire in his time, and that the number of Amphictyons was then 30.

The members were of two kinds. Each city sent two deputies, under different denominations; one called Ἱερομνημον, whose business seems to have been more immediately to inspect what related to sacrifices and ceremonies of religion; the other Πυλαγορας, charged with hearing and deciding of causes and differences between private persons. Both had an equal right to deliberate and vote, in all that related to the common interests of Greece. The *hieromnemon* was elected by lot; the *pylagoras* by plurality of voices.

Though the Amphictyons were first instituted at Thermopylæ, M. de Valois maintains, that their first place of residence was at Delphi; where, for some ages, the tranquillity of the times found them no other employment than that of being, if we may so call it, church-wardens of the temple of Apollo. In after-times, the approach of armies frequently drove them to Thermopylæ, where they took their station, to be nearer at hand to oppose the enemies progress and order timely succour to the cities in danger. Their ordinary residence, however, was at Delphi.

Here they decided all public differences and disputes between any of the cities of Greece; but before they entered on business, they jointly sacrificed an ox cut into small pieces, as a symbol of their union. Their determinations were received with the greatest veneration, and even held sacred and inviolable.

The Amphictyons, at their admission, took a solemn oath never to divest any city of the right of deputation; never to avert its running waters; and if any attempts of this kind were made by others, to make mortal war against them: more particularly, in case of any attempt to rob the temple of any of its ornaments, that they would employ hands, feet, tongue, their whole power to revenge it.—This oath was backed with terrible imprecations against such as should violate it; *e.g.* May they meet all the vengeance of Apollo, Diana, Minerva, &c. their soil produce no fruit, their wives bring forth nothing but monsters, &c.

The stated terms of their meeting was in spring and autumn; the spring meeting was called Εαρινη Πυλαια that in autumn Μετοπωρινη. On extraordinary occasions, however, they met at any time of the year, or even continued sitting all the year round.

Philip of Macedon usurped the right of presiding in the assembly of the Amphyctions, and of first consulting the oracle which was called Προμαντεια.

AMPHIDROMIA, a feast celebrated by the ancients on the fifth day after the birth of a child.

AMPHIDRYON, in ecclesiastical writers, denotes the veil or curtain which was drawn before the door of the bema in ancient churches.

AMPHILOCHIA (anc. geog.), the territory of the city of Argos in Arcanania; *Amphilochium*, (Thucidydes); called *Amphilochi* (from the people,) in the council. Under Augustus, the city of Nicopolis was lower age, (Stephanus). A town also of Spain, in Gallicia, built by Teucer, and denominated from Amphilochus one of his companions, (Strabo): now *Orense*. W. Long. 8. 20. Lat. 42. 36.

AMPHILOCHIUS, bishop of Iconium, in the fourth century, was the friend of St Gregory Nazianzen, and St Basil. He assisted at the first general council of Constantinople in 381; presided at the council of Sidæ; and was a strenuous opposer of the Arians. He died in 394, and his works were published in Greek and Latin at Paris 1644, by Francis Combesis.

AMPHILOCHUS, son of Amphiaraus and Eriphyle, was a celebrated diviner. He had an altar erected to him at Athens, and an oracle at Mallus in Cilicia, which city was founded by him and Mopsus. The answers of this oracle were given by dreams; the party inquiring used to pass a night in the temple, and that night's dream was the answer. Dion Cassius mentions a picture done by order of Sextus Condianus, representing the answer he received of the oracle, in the reign of the emperor Commodus.

AMPHIMACER, in ancient poetry, a foot consisting of three syllables, whereof the first and last are long, and that in the middle short; such is the word [Cāstĭtās.]

AMPHION, son of Jupiter and Antiope; who, according to the poets, made the rocks follow his music; and at his harp the stones of Thebes danced into walls and a regular city.

AMPHIPOLES, in antiquity, the principal magistrates of Syracuse. They were established by Timoleon in the 109th Olympiad, after the expulsion of the tyrant Dionysius. They governed Syracuse for the space of 300 years: and Diodorus Siculus assures us, that they subsisted in his time.

AMPHIPOLIS, a city of Macedonia, an Athenian colony, on the Strymon, but on which side is not so certain; Pliny places it in Macedonia, on this side; but Scylax, in Thrace, on the other. The name of the town, *Amphipolis*, however, seems to reconcile their difference; because, as Thucidydes observes, it was washed on two sides by the Strymon, which dividing itself into two channels, the city stood in the middle, and on the side towards the sea there was a wall built from channel to channel. Its ancient name was Εννεα οδοι, the *Nine Ways*, (Thucidydes, Herodotus.) The citizens were called *Amphipolitani*, (Livy.) It was afterwards called *Christopolis*; now *Chrisopoli*, or *Chisopoli*, (Holstenius.)

AMPHIPOLIS, a town of Syria, on the Euphrates, built by Seleucus, called by the Syrians *Turmeda*, (Stephanus): the same with *Thapsacus*, (Pliny); and supposed to have been only renewed and adorned by Seleucus, because long famous before his time, (Xenophon.)

AMPHIPPII, in Grecian antiquity, soldiers who, in war, used two horses without saddles, and were dextrous enough to leap from one to the other.

AMPHIPRORÆ, in the naval affairs of the ancients, vessels with a prow at each end. They were used chiefly in rapid rivers and narrow channels, where it was not easy to tack about.

AMPHIPROSTYLE, in the architecture of the ancients, a temple which had four columns in the front, and as many in the aspect behind.

AMPHISBÆNA, in zoology, a genus of serpents belong-

belonging to the order of amphibia ſerpents, ſo called from the falſe notion of its having two heads, becauſe it moves with either end foremoſt.

The head of the amphiſbæna is ſmall, ſmooth, and blunt; the noſtrils are very ſmall; the eyes are minute and blackiſh; and the mouth is furniſhed with a great number of ſmall teeth. The body is cylindrical, about a foot long, and divided into about 200 annular convex ſegments like thoſe of a worm; and it has about 40 longitudinal ſtreaks, of which 12 on each ſide are in the form of ſmall croſſes like the Roman X; the anus is a tranſverſe ſlit; and the laſt ring or ſegment of the belly has eight ſmall papillæ, forming a tranſverſe line before the anus; the tail, *i. e.* all the ſpace below the anus, is ſhort, conſiſting of 30 annular ſegments, without being marked with the croſs-lines, and is thick and blunt at the point. The colour of the whole animal is black, variegated with white; but the black prevails moſt on the back, and the white on the belly. It has a great reſemblance to a worm, living in the earth, and moving equally well with either end foremoſt. There are but two ſpecies, viz. 1. The fuliginoſa, which anſwers exactly to the above deſcription, and is found in Libya and in different parts of America. 2. The alba, which is totally white, is a native of both the Indies, and is generally found in ant-hillocks. The bite of the amphiſbæna is reckoned to be mortal by many authors; but as it is not furniſhed with dog-fangs, the uſual inſtruments of conveying the poiſon of ſerpents, later writers eſteem it not to be poiſonous. They feed upon ants and earth-worms, but particularly the latter. See Plate XVIII.

Amphisbæna Aquatica, a name given by Bertrutius, Albertus, and ſeveral other authors, to that long and ſlender inſect, called by others the *ſeta aquatica*, and *vermis ſetarius*. It has the name *amphiſbæna*, from its going backwards or forwards with equal eaſe and celerity. The uſual ſize is four or five inches long, and the thickneſs of a large hair.

Dr Liſter accidentally found out the origin of this worm, in his reſearches into the hiſtory of a very different ſort of inſect. Diſſecting one of the common black beetles dug up in a garden, he found in its belly two of theſe hair worms, or amphiſbænæ; and renewing the experiment on other beetles of the ſame ſpecies, he found that they uſually contained, one, two, or three of theſe worms. As ſoon as the body of the beetle is opened, they always crawl out. When put into water they will live a conſiderable time, and ſwim nimbly about; but often put up their heads above water, as if endeavouring to make their eſcape, and ſometimes faſtening themſelves by the mouth to the ſides of the veſſel, and drawing their whole bodies after them. Theſe creatures are not only found in the waters, but buried in earth, and ſometimes on the leaves of trees, in gardens and hedges. Phil. Tranſ. Nº 83.

AMPHISCII, among geographers, a name applied to the people who inhabit the torrid zone. The Amphiſcii, as the word imports, have their ſhadows one part of the year towards the north, and the other towards the ſouth, according to the ſun's place in the ecliptic. They are alſo called *Aſcii*. See Ascii.

AMPHISSA, (anc. geog.), the capital of the Locri Oxolæ, 120 ſtadia (or 15 miles) to the weſt of Delphi, (Pauſanias.) So called, becauſe ſurrounded on all hands by mountains, (Stephanus.) Hence *Amphiſſæi*, the inhabitants; who plundered the temple at Delphi, (Demoſthenes.)—Alſo a town of Magna Græcia, at the mouth of the Sagra, on the coaſt of the Farther Calabria, ſituated between Locri and Caulona; now called *Rocella*. *Amphiſſius* the epithet, (Ovid.)

AMPHITANE, among ancient naturaliſts, a ſtone ſaid to attract gold as the loadſtone does iron. Pliny ſays it was found in that part of the Indies where the native gold lay ſo near the ſurface of the earth as to be turned up in ſmall maſſes among the earth of ant-hills; and deſcribes it to have been of a ſquare figure, and of the colour and brightneſs of gold. The deſcription plainly points out a well-known foſſil, called, by Dr Hill, *pyricubium*: this is common in the mines of moſt parts of the world; but neither this nor any other ſtone was ever ſuppoſed, in our times, to have the power of attracting gold.

AMPHITHEATRE, in antiquity, a ſpacious edifice, built either round or oval, with a number of riſing ſeats, upon which the people uſed to behold the combats of gladiators, of wild beaſts, and other ſports.

Amphitheatres were at firſt only of wood; and it was not till the reign of Auguſtus, that Statilius Taurus built one, for the firſt time, of ſtone. The lower part was of an oval figure, and called *arena*, becauſe, for the conveniency of the combatants, it was uſually ſtrewed with ſand; and round the arena were vaults ſtyled *caveæ*, in which were confined the wild beaſts appointed for the ſhews.

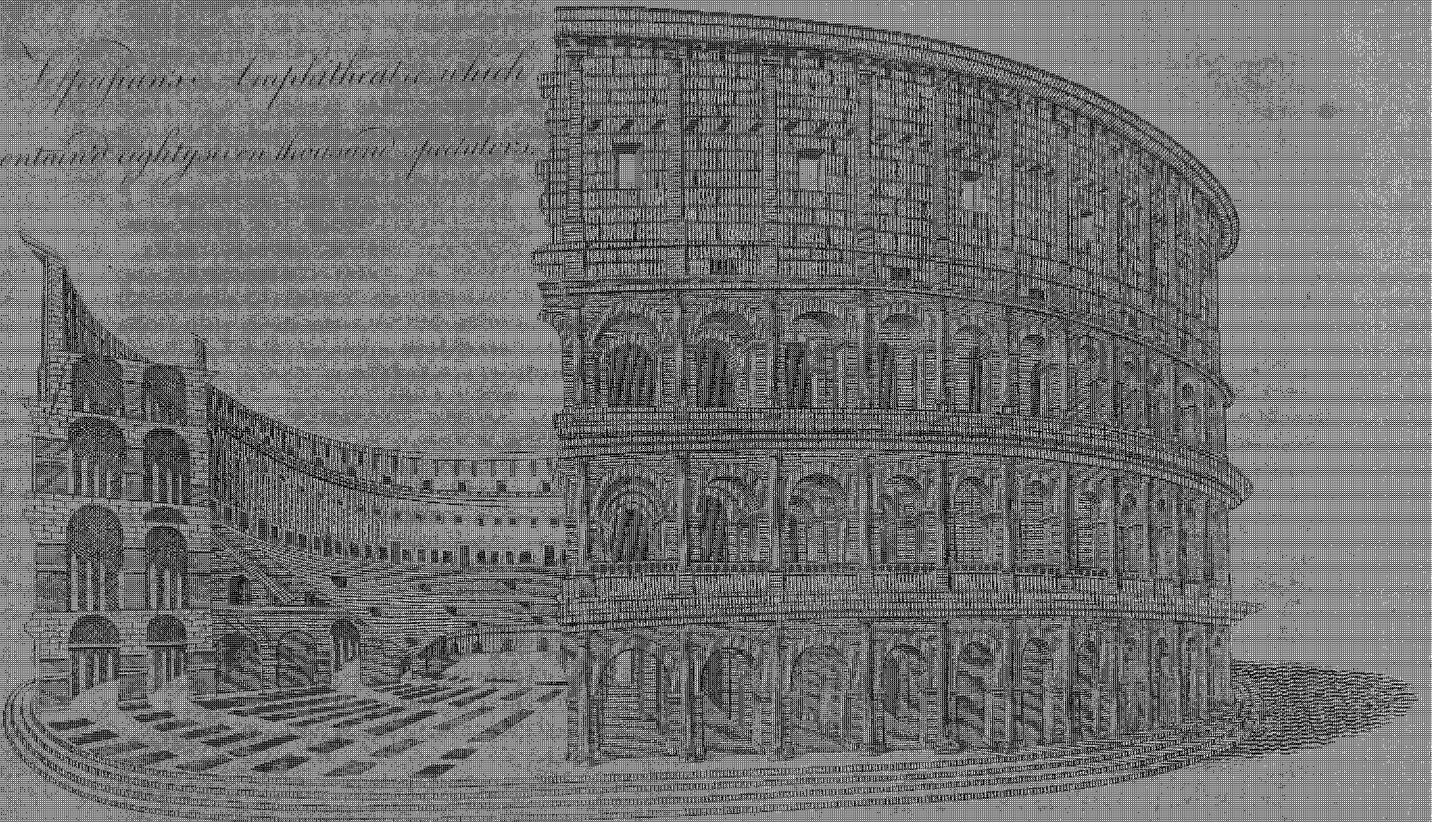
Above the caveæ was erected a large circular periſtyle, or podium, adorned with columns. This was the place of the emperors, ſenators, and other perſons of diſtinction.

The rows of benches were above the podium. Their figure was circular; and they were entered by avenues, at the end of which were gates called *vomitoriæ*.

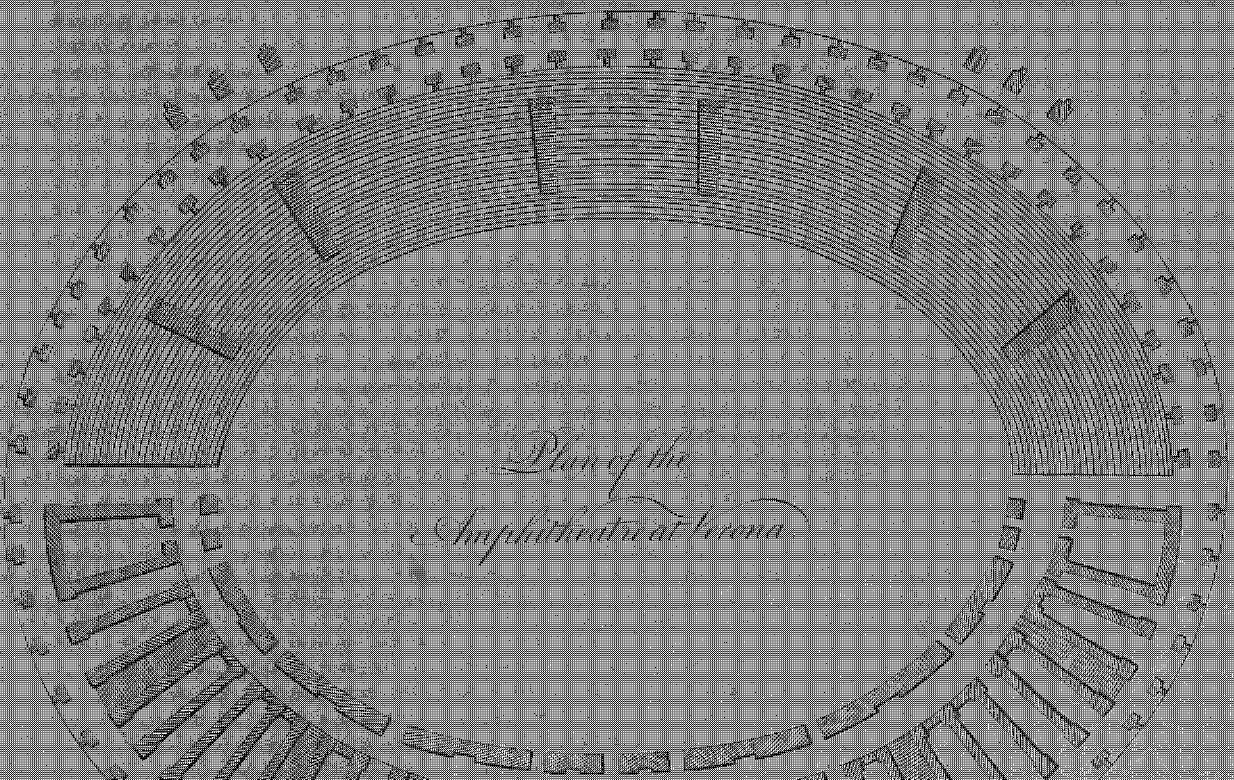
This theatre was built in form of a ſemicircle, only exceeding a juſt ſemicircle by one fourth part of the diameter; and the amphitheatre was nothing elſe but a double theatre, or two theatres joined together: ſo that the longeſt diameter of the amphitheatre was to the ſhorteſt as $1\frac{1}{2}$ to 1.

There are amphitheatres ſtill ſtanding at Rome, at Pola, at Niſmes, &c. The amphitheatre of Veſpaſian, called the *Coliſeum*, and that at Verona in Italy, are the moſt celebrated now remaining of all antiquity. Remains of amphitheatres are ſhown alſo at Arles, Bourdeaux, &c. The amphitheatre at Pola, an ancient republic of Iſtria, is very entire: it conſiſts of two orders of Tuſcan pillars, one over the other. The lower have pedeſtals, which is extraordinary; this order having ſcarce ever more than baſes to ſupport them. The amphitheatre of Veſpaſian is computed to have been capable of holding 87,000 ſpectators. That of Verona is the beſt preſerved: for though moſt of the great and beſt ſtones of the outſide are picked out, yet the great vault, on which the rows of the ſeats are laid, is entire; the rows alſo (which are 44 in number) are entire. Every row is a foot and a half high, and as much in breadth; ſo that a man ſits conveniently in them; and allowing for a ſeat a foot and a half, the whole will hold 23,000 perſons. Pliny mentions an amphitheatre built by Curio, which turned on large iron pivots; ſo that of the ſame amphithe-

AMPHITHEATRES.



Vespasian's Amphitheatre which contained eighty seven thousand spectators.



Plan of the Amphitheatre at Verona.

atre two several theatres were occasionally made, whereon different entertainments were sometimes presented at the same time. Mr Brydone (vol. i. 295), mentions an amphitheatre at Syracuse, the theatre of which is so entire, that the *gradini* for seats still remain; but it is a small theatre, he says, in comparison of the others. See Plate XVI.

AMPHITHEATRE, in gardening, certain dispositions of trees and shrubs on the sides of hilly places, which, if the hill or rising be naturally of a circular figure, always have the best effect. They are to be formed of evergreens, such as hollies, phillereys, laurustines, bays, and such plants, observing to plant the shortest growing trees in the front, and those which will be the tallest behind, such as pines, firs, cedars of Lebanon, &c.

Amphitheatres are also sometimes formed of slopes on the sides of hills, covered only with turf; and when well kept, they are a great ornament to large gardens.

AMPHITRITE, (αμφιτριτη, from *circumferendo)*, in the heathen mythology, the wife of Neptune, and goddess of the sea, sometimes taken for the sea.

AMPHITRYON, son of Alcæus, less known by his own exploits than from his wife Alcmena's adventure. See ALCMENA.

AMPHORA, in antiquity, a liquid measure among the Greeks and Romans. The Roman amphora contained 48 sextaries, equal to about seven gallons one pint English wine-measure; and the Grecian or Attic amphora contained one-third more.

AMPHORA was also a dry measure used by the Romans, and contained about three bushels.

AMPHORA, among the Venetians, is the largest measure used for liquids, containing about 16 quarts.

AMPHORARIUM VINUM, in antiquity, denotes that which is drawn or poured into *amphoræ* or pitchers; by way of distinction from *vinum doliare*, or cask wine.—The Romans had a method of keeping wine in *amphoræ* for many years to ripen, by fastening the lids tight down with pitch or gypsum, and placing them either in a situation where the smoke came, or under ground.

AMPHOTIDES, in antiquity, a kind of armour or covering for the ears, worn by the ancient pugiles, to prevent their adversaries from laying hold of that part.

AMPHRYSUS, or AMPHRYSSUS, (anc. geog.) a river of Phthiotis, a district of Thessaly, running by the foot of mount Othrys, from south to north, into the Enipeus at Thebes of Thessaly; where Apollo fed the herds of king Admetus (Virgil, Lucan). Another Amphrysus in Phrygia, rendering women barren, according to Pliny: Hence the epithet *Amphrysiacus* (Statius). Also a town of Phocis, at the foot of mount Parnassus, encompassed with a double wall by the Thebans in the war with Philip (Pausanias); *Amphrysia Vates*, in Virgil, denotes the Sibyl.

AMPHTHILL, a town in Bedfordshire, seated pleasantly between two hills, but in a barren soil. W. Long. 0. 29. N. Lat. 52. 2.

AMPLIATION, in a general sense, denotes the act of enlarging or extending the compass of a thing.

On a medal of the emperor Antoninus Pius, we find the title *Ampliator civium* given him, on account of his having extended the *jus civitatis*, or right of citizenship, to many states and people before excluded from that privilege. In effect, it is generally supposed to have been this prince that made the famous constitution, whereby all the subjects of the empire were made citizens of Rome.

AMPLIATION, in Roman antiquity, was the deferring to pass sentence in certain causes. This the judge did, by pronouncing the word *amplius*; or by writing the letters N. L. for *non liquet;* thereby signifying, that, as the cause was not clear, it would be necessary to bring further evidence.

AMPLIFICATION, in rhetoric, part of a discourse or speech, wherein a crime is aggravated, a praise or commendation heightened, or a narration enlarged, by an enumeration of circumstances; so as to excite the proper emotions in the souls of the auditors. Such is the passage in Virgil, where, instead of saying merely that Turnus died, he amplifies the circumstances of his death.

—Ast illi solvuntur frigore membra,
Vitaque cum gemitu fugit indignata sub umbras.

The masters of eloquence made amplification to be the soul of discourse. See ORATORY, n° 39.

AMPLITUDE, in astronomy, an arch of the horizon intercepted between the east or west point and the centre of the sun, or a planet, at its rising or setting; and so is either north and south, or ortive and occasive.

Magnetical AMPLITUDE, the different rising or setting of the sun from the east or west points of the compass. It is found by observing the sun, at its rising and setting, by an amplitude-compass.

AMPSAGA, a river of ancient Numidia. See ALGIERS, n° 57.

AMPSANCTI VALLIS, or AMPSANCTI LACUS, a cave or lake in the heart of the Hirpini, or Principato Ultra, near the city Tricento (Cicero, Virgil, Pliny); it is now called *Moffetta*, from Mephitis, the goddess of stench, who had a temple there. The ancient poets imagined that this gulph led to hell. The Moffetta is thus described by Mr Swinburn: "We were led into a narrow valley, extending a considerable way to the south-west, and pressed in on both sides by high ridges thickly covered with copses of oak. The bottom of the dell is bare and arid: in the lowest part, and close under one of the hills, is an oval pond of muddy ash-coloured water, not above 50 feet in diameter: it boils up in several places with great force in irregular fits, which are always preceded by a hissing sound. The water was several times spouted up as high as our heads in a diagonal direction, a whirlpool being formed round the tube, like a bason, to receive it as it fell. A large body of vapour is continually thrown out with a loud rumbling noise. The stones on the rising ground that hangs over the pool are quite yellow, being stained with the fumes of sulphur and sal-ammoniac. A most nauseous smell rising with the steam obliged us to watch the wind, and to keep clear of it, to avoid suffocation. The water is quite insipid both as to taste and smell; the clay at the edges is white, and carried into Puglia to rub upon scabby sheep, on which account the lake is farmed out at 100 ducats a-year. On a hill above this lake stood formerly a temple dedicated to the goddess Mephitis; but I perceived no remains of it."

AMPULLA, in antiquity, a round big-bellied vessel,

sel which the ancients used in their baths, to contain oil for anointing their bodies.—Also the name of a cup for drinking out of at table.

AMPULLA, among ecclesiastical writers, denotes one of the sacred vessels used at the altars. Ampullæ were also used for holding the oil used in chrismation, consecration, coronation, &c. Among the ornaments of churches we find frequent mention made of ampuls or vials. In the inventory of the cathedral of Lincoln we meet with ampuls of chrystal, variously enriched with silver feet and covers; one containing a tooth of St Christopher, another a tooth of St Cecily, another a bone of the head of St John Baptist.

Knights of St AMPULLA, belong to an order instituted by Clovis I. king of France; at the coronation they bear up the canopy, under which the ampulla is carried in procession.

AMPURA, a province of the kingdom of Peru, before its conquest by the Spaniards. Here the inhabitants worshipped two lofty mountains from a principle of gratitude, because of the descent of the water from them by which their lands were fertilized. It is said to have been conquered by Virachoca, the eighth Inca.

AMPURIAS, the capital of the territory of Ampurdan, in Catalonia, seated at the mouth of the river Fluvia, in E. Long. 2. 56. N. Lat. 42. 5. The land about it is barren, full of briars and bulrushes, except in some places which produce flax.

AMPUTATION, in surgery, the cutting off a limb, or any part from the body. See SURGERY-*Index*.

AMRAPHEL, the king of Shinar, or, Babylonia, confederated with Chedorlaomer, king of the Elamites, and two other kings, to make war against the kings of Pentapolis; that is to say, of Sodom, Gomorrah, and the three neighbouring cities. The kings who were in league with Amraphel worsted those of Pentapolis, plundered their city, and carried off abundance of captives, among whom was Lot, Abraham's nephew: but Abraham pursued them, retook Lot, and recovered all the spoil. See ABRAHAM.

AMRAS, a strong castle of Germany, seated in Tirol; by some German writers called *Arx Ambrosiana*, which was the house of pleasure for the archdukes to retire to in the heat of the summer. By others this fort is called *Ombrass*; a name derived from the design of it, which was to be a shady summer-house. It is most delightfully situated at the foot of a mountain, but has no great external beauty. All the furniture of ordinary use has been carried away; yet it is still remarkable for its galleries, which contain a very large collection of antiquities, and both natural and artificial curiosities. It excels all others in its curious collection of armour and coats of mail, many of which belonged to very great men. There is also a great collection of gold medals, which weigh, as they affirm, about 16 pounds; there are also 3000 cameos and intaglios, but few of them very fine. A great part of these antiquities were sent to this place by Charles V. On the walls and cieling there are some very good paintings; and, among the rest, they have an admirable picture of Noah's ark, done by Bassano, for which the grand duke of Tuscany is said to have offered 100,000 crowns. They have a library, which is not in very good order; and a gallery full of busts and other pieces of antiquity, besides many other apartments adorned with pictures of great value. E. Long. 11. 40. N. Lat. 47. 0.

AMSANCTI. See AMPSANCTI.

AMSBURY, or AMBERSBURY, a town in Wiltshire, lying in W. Long. 1. 20. N. Lat. 51. 29. It is the *Pagus Ambri*, famous for a monastery built by one Ambrus, and afterwards for a nunnery of noble women. There is a nobleman's seat here built by Inigo Jones, to which new works were added under the direction of Lord Burlington. It is 80 miles west of London, and six miles north of Salisbury.

AMSDORFIANS, in church-history, a sect of Protestants in the 16th century, who took their name from Amsdorf their leader. They maintained, that good works were not only unprofitable, but were obstacles to salvation.

AMSTERDAM, the capital city of the province of Holland and of the United Netherlands, is seated on the river Amstel and an arm of the sea called the *Wye*. The air is but indifferent, on account of the marshes that surround it, and render the city almost inaccessible: but this inconvenience is abundantly recompensed by the utility of its commerce, which the port serves greatly to promote; for it will contain above a thousand large ships.

In 1204, it was nothing but a small castle, called *Amstel* from the name of the river, which its lords made a retreat for fishermen, who at first lived in huts covered with thatch: but it soon became considerable, and had a bridge and towers built about it, insomuch that it rose to a small city; though, till the year 1490, it was surrounded with nothing but a weak pallisado. The walls were then built with brick, to defend it from the incursions of the inhabitants of Utrecht, with whom the Hollanders were often quarrelling; but some months afterwards it was almost reduced to ashes. In 1512, it was besieged by the people of Guelderland; who, not being able to take it, set fire to the ships in the harbour. In 1525, an Anabaptist leader, with 600 of his followers, got into the city in the night-time, attacked the town-house, and defeated those that made any resistance. At length they barricaded, with wool and hop-sacks, the avenues to the market-place, where these enthusiasts were posted; and so put a stop to their fury till day appeared, at which time the citizens fell upon them on all sides, and forced them to retire into the town-house, where most of them were cut to pieces. About ten years after, there was another tumult raised by a parcel of fanatics, consisting of men and women, who ran about the streets stark naked, and had a design of making themselves masters of the town-house. Their shrieks and cries, which were dreadful enough, soon alarmed the inhabitants, who seized the greatest part of them, and gave them the chastisement they deserved.

Amsterdam was one of the last cities that embraced the reformed religion. It was besieged by the Hollanders in 1578, and submitted after a siege of ten months. One article of the capitulation was, a free exercise of the Roman-catholic religion: but this was not observed by the Protestants; for they soon drove the ecclesiastics, monks, and nuns, out of the city, broke the images, and demolished the altars. From this time it became the general rendezvous of all nations and of every

Amsterdam every sect, which raised it to that degree of grandeur and opulence it now enjoys. The inhabitants were often obliged to enlarge the bounds of their city, and in 1675 it was increased to its present extent. It was surrounded with a brick wall, and a large ditch, 80 feet broad, full of running water. The walls were fortified with 26 bastions, on each of which there is now a windmill. There are eight gates towards the land, and one towards the water.

Amsterdam being seated on a marshy soil, is built on piles of wood; for which reason no coaches are allowed, except to great men and physicians, who pay a tax for that privilege; and all kinds of goods are drawn on sledges. It stands so low, that they would be exposed to inundations, if they did not secure themselves by dikes and sluices. The finest streets are, the Keysar's Graft, or Emperor's Canal; the Heer Graft, or Lord's Canal; The Cingel; and the street of Haerlem. The principal canal is remarkable for its houses, which are magnificent structures of an equal height. Here are three prodigious sluices, and a great number of canals, which cross the city in many parts, and render the streets clean and pleasant. The canals are deep, their sides are lined with hewn stone, they have generally rows of trees planted on each side, and many stone bridges over different parts of them.

The finest is that called the *Ammarack*, which is formed by the waters of the Amstel, into which the tide comes up, and on the sides of which are two large quays. This canal has several bridges. The principal is that next the sea, called *Pont-Neuf*, or the *New-Bridge*: it is 600 feet long, and 70 broad, with iron balustrades on each side; it has 36 arches, of which 11 are very high, and eight are shut up to inclose the yachts. From this bridge there is a most charming prospect of the city, port, and sea. The port is a mile and a half in length, and about 1000 paces in breadth. It is always filled with a multitude of vessels, which look like a forest, or rather a floating city. The streets in general are well paved, and the houses built of brick or stone. Towards the sides of the haven, the city is inclosed with great poles driven into the ground, which are joined by large beams placed horizontally. There are openings to let the ships in and out, which are shut every night at the ringing of a bell.

Amsterdam is computed to be half as big as London, including the fortifications, and almost as populous in proportion. There are people here of almost every nation and religion in Europe, who are all tolerated in their respective persuasions; but none admitted to any share in the government except the Calvinists. There are eleven churches for the Dutch of the established or Calvinistical religion, with two French and one High Dutch. The English have also three churches in this city; one for the Presbyterians, whose ministers are paid by the magistrates; a second for those of the church of England, whose minister is paid by his Britannic majesty; and a third for the Brownists, who maintain their own ministers. None but the Calvinists are allowed to have bells, and their ministers are maintained by the magistrates. All these churches or congregations make up only a third part of the inhabitants of the city. The Roman Catholics, who have 27 houses or chapels, for their worship, form another third part. Here they have a long square of houses for their beguines (a kind of nuns) to live in; who are not shut up in cloysters as other nuns in Roman-Catholic countries, but have liberty to walk abroad, and may even marry when they are tired of this kind of life. These chapels of the Roman-Catholics have no bells allowed them, being looked upon as conventicles, and may be shut up and opened according as the government pleases. The other third part of the city is made up of Jews, Lutherans, Arminians, Anabaptists, &c. none of whom, as was said of the Roman-Catholics, are allowed to have bells in their churches. Those who marry, and are not of the established religion, are obliged to be joined first by the magistrates, and then they may perform the ceremony in their own assemblies. The Jews, who are very considerable in this place, have two synagogues; one of which, namely, the Portuguese, is the largest in Europe. Within the court-yard, where their synagogue stands, they have several rooms or schools, where their children are taught Hebrew, and very carefully instructed in the Jewish religion.

The most remarkable of the religious buildings is the New Church, dedicated to St Catharine. It was begun in the year 1408, others say 1414; and was 100 years a-building. It had the misfortune of being burnt in the year 1645, but was in a short time after built in a more magnificent manner. The foundation of a steeple is laid before this church, which was designed to be very high. The piles on which it was to be erected are not above 100 feet square, and yet they are 6334 in number, and those very large. Nevertheless it was thought that these vast piles, or rather the ground, were not able to support the prodigious weight they intended to lay upon it; for which reason the steeple remains unfinished. The pulpit is a masterpiece of the kind, where the four evangelists and many other curious pieces of sculpture are represented. The glass-windows are adorned with paintings, among which the emperor Maximilian is described, presenting an imperial crown to the burgomasters of Amsterdam for the crest of the arms of this city. The organ is very large, and reckoned one of the best in the world. It has a set of pipes that counterfeit a chorus of voices, and has 52 whole stops, besides half stops, with two rows of keps for the feet, and three rows of keys for the hands. These who hear it play for the first time, imagine they hear a human voice. The grate dividing the chancel from the body of the church is all of Corinthian brass. The branches of candlesticks are the richest in the Seven Provinces. There is a very fine marble monument erected to Admiral Ruyter, who was killed at Messina.

The public buildings of a civil nature are very magnificent. The stadt-house was founded in 1648. It is built upon 14,000 wooden piles; and its front is 282 feet long, its sides 255 feet, and its height to the roof 116. There is a marble pediment in the front, whereon a woman is carved in relievo, holding the arms of the city; she is seated in a chair, supported by two lions, with an olive branch in her right hand; on each side are four Naiads, who present her with a crown of palm and laurel, and two other marine goddesses present her with different sorts of fruit; besides, there is Neptune with his trident, accompanied with Tritons, a sea-unicorn, Amſterdam corn, and a ſea-horſe. On the top ſtand three ſtatues in bronze, repreſenting Juſtice, Strength, and Plenty. On the top of the ſtructure is a round tower, 50 feet above the roof, adorned with ſtatues, and an harmonious chime of bells, the biggeſt of which weighs about 7000 pounds, and the next 6000. They are made to play different tunes every month. It has not one handſome gate, but only ſeven doors to anſwer to the number of the United Provinces. On the floor of the great hall are two globes, the celeſtial and terreſtrial, which are 22 feet in diameter and 69 in circumference. They are made of white and black marble, and are inlaid with jaſper and copper. In general all the chambers are enriched with paintings, carvings, and gildings. While this ſtadt-houſe was building, the old one was ſet on fire, and conſumed with all the archives and regiſters.

Under the ſtadt-houſe is a prodigious vault, wherein is kept the bank of Amſterdam, where there is a vaſt quantity of ingots both of gold and ſilver, as alſo bags, which are ſuppoſed to be full of money. The doors are proof againſt petards, and are never opened but in the preſence of one of the burgomaſters. The priſons for debtors and criminals are likewiſe under the ſtadt-houſe: as alſo the guard-room for the citizens, wherein the keys of the city are locked every night. At the end of the great hall is the ſchepens or aldermen's chamber, where civil cauſes are tried. Beſides theſe, there are the chambers of the ſenate and council, the burgomaſters chamber, the chambers of accounts, &c. In the ſecond ſtory is a large magazine of arms; and on the top of the building are ſix large ciſterns of water, which may be conveyed to any room in the houſe in caſe of fire; to prevent which the chimnies are lined with copper.

The bourſe, or exchange, where the merchants aſſemble, is all of free-ſtone, and built upon 2000 wooden piles. Its length is about 250 feet and its breadth 140. The galleries are ſupported by 26 marble columns, upon each of which are the names of the people that are to meet there. They are all numbered; and there is a place affixed for every merchandize under ſome one of theſe numbers. On the right hand of the gate is a ſuperb ſtair-caſe which leads to the galleries; on one ſide of which there are ſeveral ſhops, and on the other a place to ſell clothes. It is not unlike the royal exchange in London.

The admiralty-office, is in a houſe which belonged formerly to the princes of Orange. The arſenal for their men of war is in the harbour. This is a very handſome building, 200 feet long and 22 broad. The ground floor is filled with bullets; the ſecond floor contains the arms and cordage; the third their ſails, pulleys, flags, &c. This arſenal contains a great many curioſities; among the reſt an Indian canoe brought from the ſtraits of Davies, and a conſervatory of water on the top of the houſe that holds 1600 tuns of water, which may be diſtributed in caſe of fire into 16 different parts by leaden pipes. Hard by this edifice you ſee the dock or yard where they build their men of war. This dock is 508 feet long, and contiguous to it are houſes for lodging the ſhip-carpenters. The dock is plentifully ſupplied with every thing neceſſary for the conſtruction of ſhips.

The Eaſt-India company occupy a large building divided into ſeveral offices or apartments. In ſome Amſterdam of thoſe they have great ſtores of packed goods, and likewiſe a room with all ſorts of drugs, tea, wax, ambergriſe, and muſk. Here they have a magazine full of medicaments for ſurgeons cheſts, to furniſh the company's ſhips and garriſons in the Indies; as alſo large magazines of nutmegs, cloves, mace, and cinnamon. In the court-yard there is a guard-chamber, where every night the houſe-keeper has a watch; and on the other ſide of the gate, there is a chemiſt, who with his men prepares medicines for the Indies; and adjoining to this court-yard is their warehouſe and packhouſe for pepper and groſs goods. In the new part of the city they have a magazine or palace, which may properly be called an *arſenal.* The ground on which the building ſtands is 2000 feet, and ſquare every way, reckoning the moats or burgwall about it. The two rope-alleys are 1800 feet long, on the backſide of which is a ſtore of 500 large anchors beſides ſmall ones. In this arſenal they build the ſhips belonging to the India chamber of Amſterdam; for which reaſon they have all ſorts of workhouſes here for the artificers that ſerve the company.

The academy, called the *Illuſtrious School,* is likewiſe a very fine building. It was formerly a convent belonging to the nuns of St Agnes. Here they teach Latin, the oriental languages, theology, philoſophy, hiſtory, &c. The lawyers and phyſicians have likewiſe their ſchools.

Beſides theſe, there are ſeveral hoſpitals, or houſes for orphans, for poor widows, for ſick perſons, and for mad people; all which are regulated with much prudence. The Raſp-houſe, which was formerly a nunnery, is now a ſort of a work-houſe for men that behave ill. They are commonly ſet to ſaw or raſp Braſil wood; and if they will not perform their taſk, they are put into a cellar which the water runs into, where if they do not almoſt conſtantly ply the pump, they run the riſk of being drowned. There is likewiſe a ſpin-houſe for debauched women, where they are obliged to ſpin wool, flax, and hemp, and do other work. All the hoſpitals are extremely neat, and richly adorned with pictures. They are maintained partly by voluntary contributions, which are raiſed by putting money into the poor's boxes fixed up all over the city; and partly by taxing all public diverſions, as well at fairs as elſewhere. Likewiſe every perſon that paſſes through any of the gates at candle-light pays a penny for the ſame uſes. Theſe charities are taken care of by certain officers called *deacons.* The governors are nominated by the magiſtrates out of the moſt conſiderable men in the city.

The common ſort have places of diverſion called *Spile-houſes,* where there are muſic and dancing. They are much of the ſame kind as the hops which were ſo frequent about London. If ſtrangers go there, they muſt take care not to make their addreſſes to a woman that is engaged to any other man.

There are two ſuburbs to this city; one at the gate of the regulars: and the other goes as far as Overtoon, a village a little way from Amſterdam, where boats which come from Leyden are rolled over land upon wooden rollers. There is likewiſe in this city an hoſpital for thoſe that are infected with the plague; which was built in the year 1630, and has 360 windows.

The

Amsterdam The city is governed by a senate or council, which consists of 36 persons called a *Vroedshap*, who enjoy their places for life; and when any of them dies, the remainder choose another in his stead. This senate elects deputies to be sent to the States of Holland, and appoints the chief magistrates of the city, called *Burgomasters* or *Echevins*, who are like our aldermen. The number is twelve; out of which four are chosen every year to execute the office, and are called *Burgomasters-regent*. Three of those are discharged every year, to make room for three others. One of the four is kept in to inform the new ones of the state of affairs, and also presides the three first months in the year, and the others, three months each; so that, when they are in this office, they may be compared to the lord-mayor of the city of London. These alterations and appointments are made by their own body. They dispose of all inferior offices which become vacant during their regency. They have likewise the direction of all public works, which regard the safety, tranquillity, and embellishment of the city. The keys of the famous bank of this city are in the hands of these magistrates.

The college consists of new burgomasters or echevins, who are judges in all criminal affairs, without appeal; but in civil causes they may appeal to the council of the province. There are two treasurers, a bailiff, and a pensionary. The bailiff continues in his office three years; and searches after criminals, takes care to prosecute them, and sees their sentence executed. The pensionary is the minister of the magistracy, is well versed in the laws, makes public harangues, and is the defender of the interests of the city. The city of Amsterdam contributes to the public income above 50,000 livres per day, besides the excise of beer, flesh, and corn; which, in all, amounts to above 1,600,000 l. a-year. This is more than is paid by all the rest of the provinces put together; and yet Amsterdam bears but the fifth rank in the assembly of the states of Holland, with this distinction, that whereas other cities send two members, this sends four.

The militia of Amsterdam is very considerable. They have 60 companies, each of which has from 200 to 300 men. Jews and Anabaptists are excluded from this service, not being admitted to bear arms: But they are obliged to contribute to the maintenance of the city-guard, which consists of 1400 soldiers; as also to the night-watch, who patrole about the streets and proclaim the hour. Besides these, there are trumpeters on every church steeple, who sound every half hour; and if there happens a fire, they ring the fire-bell, and show where it is. The inhabitants have excellent contrivances to extinguish it speedily.

The trade of Amsterdam is prodigious: for almost the whole trade of the East India company centres in this city, which besides carries on a commerce with all the rest of the world, insomuch that it may be called the magazine or store-house of Europe. They import a vast deal of corn from the Baltic, not so much for present consumption, as to lay up against times of scarcity. The richest spices are entirely in the hands of the East-India company, who furnish all Europe therewith. They have vast quantities of military stores, with which they supply several nations; which is owing to their engrossing most of the iron-works on the Rhine and other great rivers that run into Holland. The longitude of Amsterdam is 4. 30. E.; the latitude, 52. 25. N. Amsterdam

Amsterdam, is also the name of an island in the south-sea, said to have been discovered by Tasman, a Dutch navigator. It was visited by Captain Cook in his late voyages. Its greatest extent from east to west is about 21 miles, and from north to south about 13. It is broad at the east end, and runs taper towards the west, where it turns, and runs to a point due north. It is about six leagues to the west of Middleburgh. The shore is surrounded by a coral rock, and its most elevated parts are not above six or eight yards above the level of the sea. S. Lat. 21. 11. W. Long. 175. It is wholly laid out in plantations, in which are cultivated some of the richest productions of nature.

Here are bread-fruit, cocoa-nut trees, plantains, bananas, shaddocks, yams, and some other roots, sugar-canes, and a fruit like a nectarine, called by the natives *fighega*. There did not appear an inch of waste ground: the roads occupied no more space than was absolutely necessary: the fences did not take up above four inches each; and even these were not wholly lost, for in many grew some useful trees or plants: it was every where the same, change of place altered not the scene: nature, assisted by a little art, no where appeared with more splendour than on this island. Water is not so plentiful here as at the Society-islands; but the chief pointed out a pool of fresh water unasked, to supply the ships with that necessary article. Casuarinas, pandangs, and wild sago-palms, appear here with their various tints of green, and barringtoniæ as big as the loftiest oaks. The bread-fruit does not, however, thrive here with the same luxuriance as at the Society-islands; the coral rock, which composes the basis of this spot, being much more thinly covered with mould.

Both men and women are of the common size of Europeans, and their colour is that of a lightish copper; they are well-shaped, have regular features, are active, brisk, and lively. They have fine eyes, and in general good teeth, even to an advanced age. The women are the merriest creatures imaginable, and incessant talkers. In general, they appear to be modest; although there was no want of those of a different stamp. Among the natives, who swam about the ship very vociferously, were a considerable number of women, who wantoned in the water like amphibious creatures, and were easily persuaded to come on board perfectly naked; but none of them ventured to stay there after sunset, but returned to the shore to pass the night, like the greater part of the inhabitants, under the shade of the wild wood which lined the coast. There they lighted great fires, and were heard conversing almost the whole night. The hair of both sexes in general is black, but especially that of the women; both sexes wear it short, except a single lock on the top of the head, and a small quantity on each side. The men cut or shave their beards quite close, which operation they perform with two shells. The hair of many was observed to be burnt at the ends, and strewed with a white powder, which was found, on examining it, to be lime made of shell or coral, which had corroded or burnt the hair; some made use of a blue powder, and others, both men and women, of an orange-coloured powder made of turmeric.

The dress of both sexes consists of a piece of cloth or or matting wrapped round the waiſt, and hanging down below the knees. From the waiſt upwards they are generally naked, and it ſeems to be a cuſtom to anoint theſe parts every morning. The practice of tattowing, or puncturing the ſkin, likewiſe prevails. The men are tattowed from the middle of the thigh to above the hips; the women have it only on their arms and fingers, and on thoſe parts but very ſlightly. Their ornaments are amulets, necklaces, and bracelets, the bone, ſhells, and beads of mother-of-pearl, tortoiſe-ſhell, &c. which are worn by men as well as women. The women alſo wear on their fingers neat rings made of tortoiſe-ſhell, and pieces in their ears about the ſize of a ſmall quill; but here ornaments are not commonly worn, though all have their ears pierced. They have alſo a curious apron, made of the cocoa-nut ſhell, and compoſed of a number of ſmall pieces ſewed together in ſuch a manner as to form ſtars, half-moons, little ſquares, &c.; it is ſtudded with beads and ſhells, and covered with red feathers, ſo as to have a pleaſing effect. They make the ſame kind of cloth, and of the ſame materials, as at O-Taheitee, though they have not ſuch a variety, nor do they make any ſo fine; but, as they have a method of glazing it, it is more durable, and will reſiſt rain for ſome time, which the other cloth would not. Their colours are black, brown, yellow, purple, and red; all made from vegetables. They make various ſorts of matting, ſome of a very fine texture, which is generally uſed for clothing; and the thick and ſtronger ſort ſerves to ſleep upon, and to make ſails for their canoes, &c. Among other uſeful utenſils, they have various ſorts of baſkets, ſome made of the ſame materials as the mats, and others of the twiſted fibres of cocoa-nuts. Theſe are not only durable, but beautiful, being generally compoſed of different colours, and ſtudded with beads made of ſhells or bones. They have many little nicknacks among them, which ſhow that they neither want taſte to deſign, nor ſkill to execute, whatever they take in hand. Their fiſhing implements are much the ſame as in other iſlands: here was purchaſed a fiſh-net made like our caſting-nets, knit of very firm though ſlender threads.

Notwithſtanding their very friendly diſpoſition, theſe people have very formidable weapons; ſome of their ſpears have many barbs, and muſt be very dangerous weapons when they take effect. A large flat ſhell or breaſt-plate was purchaſed, made of a roundiſh bone, white and poliſhed like ivory, about 18 inches in diameter, which appeared to have belonged to an animal of the whale tribe.

AMULET, a charm, or preſervative againſt miſchief, witchcraft, or diſeaſes.

Amulets were made of ſtone, metals, ſimples, animals, and in a word, of every thing that imagination ſuggeſted.

Sometimes they conſiſted of words, characters, and ſentences, ranged in a particular order, and engraved upon wood, *&c.* and worn about the neck, or ſome other part of the body. See ABRACADABRA.

At other times they were neither written nor engraved; but prepared with many ſuperſtitious ceremonies, great regard being uſually paid to the influence of the ſtars. The Arabians have given to this ſpecies of amulet the name of TALISMAN.

All nations have been fond of amulets: the Jews were extremely ſuperſtitious in the uſe of them, to drive away diſeaſes; and the Miſna forbids them, unleſs received from an approved man who had cured at leaſt three perſons before by the ſame means.

Among the Chriſtians of the early times, amulets were made of the wood of the croſs, or ribbands with a text of ſcripture written in them, as preſervatives againſt diſeaſes. Notwithſtanding the progreſs of learning and refinement, there is not any country in Europe, even at this day, who do not believe in ſome charm or other. The pope is ſuppoſed to have the virtue of making amulets, which he exerciſes in the conſecrating of *Agnus Deis*, &c. The ſpunge which has wiped his table, was formerly in great veneration as a preſervative from wounds, and from death itſelf: on this account it was ſent with great ſolemnity by Gregory II. to the duke of Aquitain.

Amulets are now much fallen from the repute they were anciently in: yet the great Mr Boyle alleges them as an inſtance of the increaſe of external effluvia into the habit, in order to ſhow the great poroſity of the human body. He adds, that he is perſuaded ſome of theſe external medicines do anſwer; for that he himſelf, having once been ſubject to bleed at the noſe, and reduced to uſe ſeveral remedies to check it, found the moſs of a dead man's ſkull, though only applied ſo as to touch the ſkin till the moſs was warm thereby, the moſt effectual of any. The ſame Mr Boyle ſhows how the effluvia, even of cold amulets, may, in tract of time, pervade the pores of a living animal; by ſuppoſing an agreement between the pores of the ſkin and the figure of the corpuſcles. Bellini has demonſtrated the poſſibility of the thing in his laſt propoſitions *De Febribus*; and the like is done by Dr Wainright, Dr Keill, &c.

AMURAT, or AMURATH, I. the fourth emperor of the Turks, and one of the greateſt princes of the Ottoman empire, ſucceed Solyman in 1360. He took from the Greeks, Gallipoli, Thrace, and Adrianople, which laſt he choſe for the place of his reſidence. He defeated the prince of Bulgaria, conquered Miſnia, chaſtiſed his rebellious baſhaws, and is ſaid to have gained 36 battles. This prince, in order to form a body of devoted troops that might ſerve as the immediate guards of his perſon and dignity, appointed his officers to ſeize annually, as the imperial property, the fifth part of the Chriſtian youth taken in war. Theſe, after being inſtructed in the Mahometan religion, inured to obedience by ſevere diſcipline, and trained to warlike exerciſes, were formed into a body diſtinguiſhed by the name of *Janiſſaries*, or *New Soldiers*. Every ſentiment which enthuſiaſm can inſpire, every mark of diſtinction that the favour of the prince could confer, were employed in order to animate this body with martial ardour, and with a conſciouſneſs of its own pre-eminence. The Janiſſaries ſoon became the chief ſtrength and pride of the Ottoman armies, and were diſtinguiſhed above all the troops whoſe duty it was to attend on the perſon of the Sultan.—At length the death of Lazarus, deſpot of Servia, who had endeavoured in vain to ſtop the progreſs of Amurath's arms, touched Milo, one of his ſervants, in ſo ſenſible a manner, that, in revenge, he ſtabbed the ſultan in the midſt of his troops, and killed him upon the ſpot,

spot, A. D. 1389, after he had reigned 23 years.

Amurat II. the 10th emperor of the Turks, was the eldest son of Mahomet I. and succeeded his father in 1421. He besieged Constantinople and Belgrade without success; but he took Thessalonica from the Venetians, and compelled the prince of Bosnia and John Castriot prince of Albany to pay him tribute. He obliged the latter to send his three sons as hostages; among whom was George, celebrated in history by the name of *Scanderbeg*. John Hunniades defeated Amurat's troops, and obliged him to make peace with the Christian princes, in 1442. These princes afterwards breaking the peace, Amurat defeated them in the famous battle of Varna, November 10th, 1444, which proved so fatal to the Christians, and in which Ladislaus king of Hungary was killed. He afterwards defeated Hunniades, and killed above 20,000 of his men; but George Castriot, better known by the name of *Scanderbeg*, being re-established in the estates of his father, defeated the Turks several times, and obliged Amurat to raise the siege of Croia, the capital of Albany. Amurat died, chagrined with his ill success, and infirm with age, February 11th, 1451, at Adrianople. It is observed to this prince's honour, that he always kept his treaties with the greatest fidelity.

AMYCLÆ, a city of Laconia, distant about 18 miles from the metropolis, founded by Amyclas the son of Lacedæmon, and famed afterwards for the birth of Castor and Pollux the sons of Tydareus, eighth king of Sparta. It was afterwards famed for sending a considerable colony of its own inhabitants into Upper Calabria, who built there a city which they called by the same name. This last city was situated between Caieta and Terracina, and gave its name to the neighbouring sea. According to Pliny and Solinus, the territory of Amyclæ was so infested with vipers and other serpents, that the inhabitants were obliged to abandon their dwellings and settle elsewhere.—Among the ancient poets, the Amycli, or inhabitants of this city, obtained the epithet of *taciti* or *silent*. The reason of this was, either because it was built by the Lacedæmonians, who, as they followed the doctrine of Pythagoras, were always inculcating the precept of silence, and thence called *taciti*: or because of a law which obtained in this place, forbidding any one, under severe penalties, to mention the approach of an enemy. Before this law was made, the city was daily alarmed by false reports, as the enemy had been already at the gates. From terrors of this kind the abovementioned law indeed delivered them: but in the end it proved the ruin of the city: for the Dorians appearing unexpectedly under the walls, no one ventured to transgress the law; so that the city was easily taken. They reduced it to an inconsiderable hamlet; in which, however, were seen some of the remains of its ancient grandeur. One of the finest buildings that escaped the common ruin, was the temple and statue of Alexandra, whom the inhabitants pretend to be the same with Cassandra the daughter of Priam.

AMYGDALUS, the Almond and Peach: A genus of the monogynia order, belonging to the icosandria class of plants; and, in the natural method ranking under the 36th order, *Pomaceæ*. The characters are: The *calyx* is a single-leaved perianthium beneath, tubular, and quinquefid: The *corolla* consists of five oblong petals, which are inserted into the calyx: The *stamina* consist of 30 slender erect filaments, half the length of the corolla, and inserted into the calyx; the antheræ are simple: The *pistillum* has a round villous germen above; a simple stylus, the length of the stamina; and the stigma headed: The *pericarpium* is a large roundish villous drupa, with a longitudinal furrow: the seed is an ovate compressed nut, perforated in the pores.

Species. 1. The Communis, or Common Almond, a native of Africa, will grow to near 20 feet high; and whether planted singly in an open place, or mixed with others in clumps, shrubbery-quarters, &c. shows itself one of the finest flowering trees in nature. Those who never yet saw it, may easily conceive what a noble appearance this tree must make, when covered all over with a bloom of a delicate red, which will be in March; a time when very few trees are ornamented either with leaves or flowers. No ornamental plantation, therefore, of what sort or kind soever, should be without almond trees. Neither are the beauties of the flowers the only thing desirable in this tree: The fruit would render it worthy of planting, were there no other motive. It ripens well, and its goodness is well known.—The white-flowering almond is a variety of this species, and is cultivated for the sake of the flowers and the fruit, though the flowers are inferior to the others.

2. The Nana, Dwarf Almond, is a native of Asia Minor. Of this shrub there are two sorts, the single and the double. Both grow to about four or five feet high, and are in the first esteem as flowering shrubs. The single sort has its beauties; but the double kind is matchless. In both, the flowers are arranged the whole length of the last year's shoots; their colour is a delicate red; and they show themselves early in the spring, which still enhances their value.

3. The Persica, or Peach, is said to be a native of Europe; but of what place is not known. Cultivation has produced many varieties of this fruit; of which the following are the most esteemed.

1. The White Nutmeg	15. The Bellegarde
2. The Red Nutmeg	16. The Bourdine
3. The Early Purple	17. The Rossanna
4. The Small Mignon	18. The Admirable
5. The White Magdalen	19. The Old Newington
6. The Yellow Alberge	20. The Royal
7. The Large French Mignon	21. The Rambouillet
	22. The Portugal
8. The Beautiful Chevreuse	23. The Late Admirable
	24. The Nivette
9. The Red Magdalen	25. Venus's Nipple
10. The Chancellor	26. The Late Purple
11. Smith's Newington	27. The Perisque
12. The Montauban	28. The Catharine
13. The Malta	29. The Monstrous Pavy
14. The Vineuse	30. The Bloody Peach.

The White Nutmeg is the first peach in season, it being often in perfection by the end of July. The leaves are doubled serrated, the flower large, and of a pale colour; the fruit is white, small, and round; the

the fleſh, too, is white, parts from the ſtone, and has a ſugary, muſky flavour.

The Red Nutmeg hath yellowiſh green leaves, with ſerpentine edges, which are ſlightly ſerrated. The flowers are large, open, and of a deep bluiſh colour. The fruit is larger and rounder than the former, and is of a bright vermilion next the ſun, but more yellow on the other ſide. The fleſh is white, except next the ſtone, from which it ſeparates, and has a rich muſky flavour. It ripens juſt after the white nutmeg.

The Early Purple hath ſmooth leaves, terminated in a ſharp point. The flowers are large, open, and of a lively red. The fruit is large, round, and covered with a fine deep red coloured down. The fleſh is white, red next the ſtone, and full of a rich vinous juice. Ripe about the middle of Auguſt.

The ſmall Mignon hath leaves ſlightly ſerrated, and the flowers ſmall and contracted. The peach is round, of a middling ſize, tinged with darkiſh red on the ſunſide, and is of a pale yellowiſh colour on the other. The fleſh is white, parts from the ſtone, where it is red, and contains plenty of a vinous ſugary juice. Ripens rather before the former.

The White Magdalen hath long, ſhining, pale-green leaves, deeply ſerrated on the edges, and the wood is moſtly black at the pith. The flowers are large and open, appear early, and are of a pale red. The fruit is round, rather large, of a yellowiſh-white colour, except on the ſunny ſide, where it is ſlightly ſtreaked with red. The fleſh is white to the ſtone, from which it ſeparates, and the juice is pretty well flavoured. Ripe at the end of Auguſt.

The Yellow Alberge hath deep red, middle-ſized flowers; the peach is ſmaller than the former, of a yellow colour on the ſhady ſide, and of a deep red on the other. The fleſh is yellow, red at the ſtone, and the juice is ſugary and vinous.

The great French Mignon hath large, finely ſerrated leaves, and beautiful red flowers. The fruit is large, quite round, covered with a fine ſatiny down, of a browniſh red colour on the ſunny ſide, and of a greeniſh yellow on the other. The fleſh is white, eaſily parts from the ſkin, and is copiouſly ſtored with a ſugary high-flavoured juice. Ripe near the middle of Auguſt.

The beautiful Chevreuſe hath plain leaves, and ſmall contracted flowers. The fruit is rather oblong, of a middling ſize, of a fine red colour next the ſun, but yellow on the other ſide. The fleſh is yellowiſh, parts from the ſtone, and is full of a rich ſugary juice. It ripens a little after the former.

The Red Magdalen hath deeply ſerrated leaves, and large open flowers. The fruit is large, round, and of a fine red next the ſun. The fleſh is firm, white, ſeparates from the ſtone, where it is very red; the juice is ſugary, and of an exquiſite rich flavour. Ripe at the end of Auguſt.

The Chancellor hath large, ſlightly ſerrated leaves. The peach is about the ſize of the Beautiful Chevreuſe, but rather rounder. The ſkin is very thin, of a fine red on the ſunny ſide; the fleſh is white and melting, parts from the ſtone, and the juice is very rich and ſugary. It ripens with the former.

The leaves of Smith's Newington are ſerrated, and the flowers are large and open. The fruit is of a middle ſize, of a fine red on the ſunny ſide; the fleſh white and firm, but very red at the ſtone, to which it ſticks cloſely, and the juice has a pretty good flavour. Ripens with the former.

The Montauban hath ſerrated leaves, and large open flowers. The fruit is about the ſize of the former, of a purpliſh red next the ſun, but of a pale one on the ſhady ſide. The fleſh is melting, and white even to the ſtone, from which it ſeparates. The juice is rich, and well flavoured. It ripens a little before the former.

The Malta hath deeply ſerrated leaves, and the flowers are large and open. The fruit is almoſt round, of a fine red next the ſun, marbled with a deeper red, but the ſhady ſide is of a deep green. The fleſh is fine, white, except at the ſtone, from which it parts, where it is of a deep red; the juice is a little muſky, and agreeable. It ripens at the end of Auguſt, or beginning of September.

The Vineuſe hath large deep green leaves, and full bright red flowers. The fruit is round, of a middle ſize; the ſkin is thin, all over red; the fleſh fine and white, except at the ſtone, where it is very red, and the juice is copious and vinous. Ripe in the middle of September.

The Bellegarde hath ſmooth leaves, and ſmall contracted flowers. The fruit is very large, round, and of a deep purple colour next the ſun. The fleſh is white, parts from the ſtone, where it is of a deep red, and the juice is rich and excellent. It ripens early in September.

The Bourdine hath large, fine green, plain leaves, and ſmall fleſh-coloured contracted flowers. The fruit is round, of a dark red next the ſun; the fleſh white, except at the ſtone, where it is of a deep red, and the juice is rich and vinous. Ripens with the former.

The Roſſana hath plain leaves, and ſmall contracted flowers. The fruit is rather longer than the alberge, and ſome count it only a variety of the latter. The fleſh is yellow, and parts from the ſtone, where it is red; the juice is rich and vinous. Ripe early in September.

The Admirable hath plain leaves, and ſmall contracted flowers, which are of a pale red. The fruit is very large and round; the fleſh is firm, melting, and white, parts from the ſtone, and is there red; and the juice has a ſweet, ſugary, high vinous flavour. Ripe early in September.

The Old Newington hath ſerrated leaves, and large open flowers. The fruit is large, of a fine red next the ſun; the fleſh is white, ſticks cloſe to the ſtone, where it is of a deep red, and the juice has an excellent flavour. It ripens juſt after the former.

The Royal hath plain leaves, and ſmall contracted flowers. The fruit is about the ſize of the admirable, and reſembles it, except that it has ſometimes a few knobs or warts. The fleſh is white, melting, and full of a rich juice; it parts from the ſtone, and is there of a deep red. Ripe about the middle of September.

The Rambouillet hath leaves and flowers like the royal. The fruit is rather round than long, of a middling ſize, and deeply divided by a furrow. It is of a bright yellow on the ſhady ſide, but of a fine red on the other. The fleſh is melting, yellow, parts from

Amygdalus the stone, where it is of a deep red, and the juice is rich and vinous. Ripe with the former.

The Portugal hath plain leaves, and large open flowers. The fruit is large, spotted, and of a beautiful red on the sunny side. The flesh is firm, white, sticks to the stone, and is there red. The stone is small, deeply furrowed, and the juice is rich and sugary. Ripe towards the end of September.

The late Admirable hath serrated leaves, and brownish red small contracted flowers. The fruit is rather large and round, of a bright red next the sun, marbled with a deeper. The flesh is of a greenish-white, and sticks to the stone, where it hath several red veins; the juice is rich and vinous. Ripe about the middle of September.

The Nivette hath serrated leaves, and small contracted flowers. The fruit is large and roundish, of a bright red colour next the sun, but of a pale yellow on the shady-side. The flesh is of a greenish yellow, parts from the stone, where it is very red, and is copiously stored with a rich juice. It ripens about the middle of September.

Venus's Nipple hath finely serrated leaves, and rose-coloured, small contracted flowers, edged with carmine. The fruit is of a middling size, and has a rising like a breast. It is of a faint red on the sunny-side, and on the shady one of a straw-colour. The flesh is melting, white, separates from the stone, where it is red, and the juice is rich and sugary. Ripens late in September.

The Late Purple hath large, serrated leaves, which are variously contorted, and the flowers are small and contracted. The fruit is round, large, of a dark red on the sunny-side, and yellowish on the other. The flesh is melting, white, parts from the stone, where it is red, and the juice is sweet and high-flavoured. Ripens with the former.

The Persique hath large, very long indented leaves, and small contracted flowers. The fruit is large, oblong, of a fine red next the sun; the flesh firm, white, but red at the stone, juicy, and of a high pleasant flavour. The stalk has frequently a small knot upon it. Ripe late in September.

The Catharine hath plain leaves, and small flowers. The fruit is large, round, of a very dark red next the sun. The flesh white, firm, sticks close to the stone, and is there of a deep red. The juice is rich and pleasant. It ripens early in October.

The Monstrous Pavy hath large, very slightly serrated leaves, and large, but rather contracted flowers. The fruit is round, and very large, whence its name. It is of a fine red on the sunny-side, and of a greenish-white on the other. The flesh is white, melting, sticks close to the stone, and is there of a deep red. It is pretty full of juice, which in dry seasons is sugary, vinous, and agreeable. Ripe towards the end of October.

The Bloody Peach hath rather large, serrated leaves, which turn red in autumn. The fruit is of a middling size, the skin all over of a dull red, and the flesh is red down to the stone. The fruit is but dry, and the juice rather sharp and bitterish. It is well worth cultivating notwithstanding, for the fruit bake and preserve extremely well.

The peach-tree has hitherto been planted against walls for the sake of the fruit: "but, (says Hanbury), as I hardly ever knew a person who was not struck with the beauty of the flowers when in full blow against a wall, why should it not have a share in wilderness quarters, and shrubberies, amongst the sorts of almonds, &c.? It may be kept down, or permitted to grow to the height of the owner's fancy: and the flowers are inferior to none of the other sorts. Add to this, they frequently, in well-sheltered places, produce fruit which will be exceeding well-flavoured; and thus the owner may enjoy the benefit of a double treat." The above observations respect the single peach; with regard to the double-flowered, it is generally propagated for ornamental plantations, and is universally acknowledged to be one of the finest flowering-trees yet known. Against a wall, however, these trees are always the fairest; and if they have this advantage, they are succeeded by very good fruit.

The NECTARINE, according to Linnæus, is only a variety of the peach, its having a smooth coat being only an accident originally. Of this also many varieties are now cultivated; and the following are some of the most esteemed: 1. The Elruge. 2. The Newington. 3. The Scarlet. 4. The Roman. 5. The Murrey. 6. The Italian. 7. The Golden. 8. The Temple's.

The Elruge hath large serrated leaves, and small flowers. The fruit is of a middling size, of a dark purple colour next the sun, and of a greenish yellow on the shady side. The flesh parts from the stone, and has a soft, melting, good flavoured juice. Ripe early in August.

The Newington hath serrated leaves, and large open flowers. The fruit is pretty large, of a beautiful red on the sunny-side, but of a bright yellow on the other. The flesh sticks to the stone, is there of a deep red colour, and the juice has an excellent rich flavour. Ripe towards the end of August.

The Scarlet is rather less than the former, of a fine scarlet colour next the sun, but fades to a pale red on the shady side. It ripens near the time of the former.

The Roman, or cluster red nectarine, hath plain leaves, and large flowers. The fruit is large, of a deep red towards the sun, but yellowish on the shady side. The flesh is firm, sticks to the stone, and is there red; the juice is rich, and has an excellent flavour. Ripe about the end of August.

The Murrey is a middling-sized fruit, of a dirty red colour on the sunny side, and yellowish on the shady one. The flesh is firm, and tolerably well flavoured. It ripens early in September.

The Italian Nectarine hath smooth leaves and small flowers; the fruit is red next the sun, but yellowish on the other side; flesh firm, adheres to the stone, where it is red, and when ripe, which is early in September, has an excellent flavour.

The Golden Nectarine has an agreeable red colour next the sun, bright yellow on the opposite side; flesh very yellow, sticks to the stone, where it is of a pale red, has a rich flavour, and ripens in September.

Temple's Nectarine is of a middling size, of a fair red next the sun, of a yellowish green on the other side; flesh white near the stone, from which it separates

 rates; ripens in September, and has a high poignant flavour.

Propagation, &c. All the above ſpecies are propagated by inoculating them into plum-ſtocks in Auguſt. The ſtocks ſhould be firſt planted in the nurſery when of the ſize of a ſtraw; and the firſt or ſecond ſummer after they will be ready to receive the bud. The uſual method of inoculation muſt be obſerved, and there is no danger of ſucceſs; though it may be proper to obſerve, that the double-bloſſomed peach ſhould always be worked into the ſtocks of the muſſel-plum. The two ſorts of dwarf-almond may alſo be propagated by layers, or from the ſuckers, which they ſometimes ſend forth in great plenty.

The varieties of the peach are produced like thoſe of the finer flowers, by ſowing the ſeeds; and though many raiſed this way will be of little value, as is alſo the caſe of flowers, yet probably among a parcel of ſtones, ſaved from the finer kinds of peaches, there would be ſome new kinds produced. The beſt method of ſaving the ſtones is, to let ſome of the fineſt peaches of the beſt kinds hang till they drop of themſelves from the tree, and then the ſtones ſhould be immediately planted on a bed of light dry earth, planting them about three inches deep in the earth, and at about four inches aſunder. The beds ſhould be covered to preſerve them in the winter; and in ſpring, when the plants come up, they muſt be cleared of weeds, and well watered. The next ſpring they ſhould be carefully taken up, and planted in the nurſery, in rows three feet aſunder, and one foot diſtant from each other; laying a little mulch upon the ſurface of the ground about their roots, and in a dry ſpring watering them once in a week; and after one or two years ſtanding here, they may be removed to the places where they are to remain; or they may, at that time, when the condition of their fruit is known, be grafted on other ſtocks.

There are two general rules given for the pruning of peach and nectarine trees; viz. 1. Always to have enough of bearing wood; and, 2. Not to lay in the branches too cloſe to one another. All peach trees produce their fruit from the young wood either of the ſame, or at the moſt of the former year's ſhoot; for which reaſon the branches are to be ſo pruned, as to encourage them to throw out new ſhoots in every part of the tree: and this is to be done in May; when by pinching, or ſtopping the ſtrong ſhoots, there may be new wood forced out in any part of the tree. This is the method of the ſummer pruning: the winter pruning is uſually done in February or March; but is much better done at Michaelmas, as ſoon as their leaves begin to fall; and the wounds will then have time to heal before the ſevere froſts come on.

In pruning of theſe trees it muſt always be obſerved alſo, that it is beſt done under a wood bud, not a bloſſom bud; which may be diſtinguiſhed by the wood bud's being leſs turgid, and longer and narrower than the bloſſom bud; for if the ſhoot have not a leading bud where it is cut, it will commonly die down to the leading bud. In nailing the ſhoots to the wall, they ſhould be placed at as equal diſtances as poſſible; and ſo far apart that the leaves may have room; and they muſt always be trained as horizontally as poſſible, that the lower part of the tree may be well wooded, which it will not be if the branches are ſuffered to run upright. When the fruit is ſet and grown to the ſize of a ſmall nut, it ſhould be thinned, and left five or ſix inches aſunder: by this management the fruit will be larger and better taſted, and the trees in a condition to bear well the ſucceeding year. The quantity of fruit to be left on large full grown trees ſhould never be greater than five dozen upon each; but on middling trees, three or four dozen will be enough. If the ſeaſon ſhould prove hot and dry, it will be proper to draw up the earth round the ſtem of each tree, to form a hollow baſon of about ſix feet in diameter, and cover the ſurface of the ground in this baſon with mulch; and once in a week or fortnight, according to the drought of the ſeaſon, to pour down eight or ten gallons of water to the root of each tree; or the water may be ſprinkled by an engine over the branches of the trees, which, ſhaking down to the roots, will promote the growth of the fruit and prevent it falling off the trees. This, however, ſhould be continued only while the fruit is growing.

The peach-tree, as well as the roſe-tree, are very ſubject to be over-run with the aphides; which may be deſtroyed by fumigating the houſe in which the plants are kept with tobacco, or, which is ſaid to be the moſt effectual method, by ſteam raiſed from water poured over the flues*.—Soap-ſuds are ſaid to deſtroy effectually the different ſpecies of inſects that infeſt fruit-trees growing againſt walls, and particularly the peach, cherry, and plum. For this purpoſe, a perſon on a ladder, ſhould pour them from a watering-pot over both trees and wall, beginning at the top of the wall, and bringing it on in courſes from top to bottom. The ſuds contribute likewiſe, it is ſaid, to preſerve the wood of the delicate and tender kinds of peaches.

* See *Kyle on forcing peaches*, &c.

Uſes. Sweet almonds are reckoned to afford little nouriſhment; and, when eaten in ſubſtance, are not eaſy of digeſtion, unleſs thoroughly comminuted: Peeled, and eaten ſix or eight at a time, they ſometimes give preſent relief in the heart-burn. But in medicine they are moſtly uſed for making emulſions; and they abound not only with an oil, but likewiſe with a mucilage fit for incorporating oil and water together.

Emulſions are commonly prepared from almonds, by beating an ounce of them, after being blanched, into a fine pulp, in a marble or ſtone mortar; and triturating them well with half an ounce (more or leſs) of fine ſugar; and then adding by little at a time, a quart of water; taking care to continue grinding them while the water is poured on; after which the white milky liquor is ſtrained through a cloth, and put into a quart bottle. Some people add a drachm of blanched bitter almonds to an ounce of the ſweet, which they think make the emulſions more agreeable. Such emulſions have been much uſed as drink in acute diſeaſes, for diluting and blunting acrimonious juices in the firſt paſſages, and acrid ſaline particles in the blood; and for ſoftening and lubricating the fibres and membranes.

It has been a common practice to diſſolve from half an ounce to an ounce, or more, of gum-arabic in the water used for making the emulsions; and to make patients drink freely of them, while blisters are applied to the body, in order to prevent strangury; and to order them to be used in cases of gravel, and of inflammation of the bladder or urethra; and in heat of urine from virulent gonorrhœa or other causes.

Camphor, resin of jalap, and other resinous substances, by being triturated with almonds, become miscible with water, and more mild and pleasant than they were before; and therefore they are frequently ordered to be rubbed with them, and made up into pills or boluses, with the addition of some conserve or gum-arabic mucilage; or they are incorporated with watery liquors into the form of an emulsion.

Formerly the seeds of the lettuce, of the cucumber, of the white poppy, and of a number of other plants, were employed for making emulsions; but now the sweet almonds supply the place of all the rest.

The bitter almonds are not so much used as they were formerly; because they have been found to destroy some sorts of animals: this effect was related by the ancients, but believed to be fictitious; because when eaten by men they appear to be innocent, and to produce no deleterious effects. However, the facts related by Wepfer in his Treatise *de Cicuta Aquatica*, having been confirmed by latter experiments; and it having been discovered that a water drawn from them had deleterious effects, and that the distilled water from the lauro-cerasus leaves, which have a bitter taste resembling that of bitter almonds, was still more poisonous; it raised a suspicion of the wholesomeness of those bitter substances, and has made physicians more cautious of using them, though they have been employed for making orgeate and other liquors, without producing any bad effects.

As to the peach and nectarine, they are sufficiently known as delicious fruits. Peach-flowers have an agreeable smell, and a bitterish taste: distilled, without any addition, by the heat of a water-bath, they yield one-sixth their weight, or more, of a whitish liquor, which, as Mr Bolduc observes, communicates to a large quantity of other liquids a flavour like that of the kernels of fruits. An infusion in water of half an ounce of the fresh gathered flowers, or a dram of them when dried, sweetened with sugar, proves for children an useful laxative and anthelmintic: the leaves of the tree are, with this intention, somewhat more efficacious, though less agreeable. The fruit has the same quality with the other sweet fruits, that of abating heat, quenching thirst, and gently loosening the belly.

AMYLACEOUS, from *amylum* "starch;" a term applied to the fine flour of farinaceous seeds, in which consists their nutritive part. See Bread.

AMYNTA, in literary history, a beautiful pastoral comedy, composed by Tasso; the model of all dramatic pieces wherein shepherds are actors. The *Pastor Fido*, and *Filli di Sciro*, are only copies of this excellent piece.

AMYNTOR, αμυντωρ, formed of the verb αμυνω, *I defend*, or *avenge*, properly denotes a person who defends or vindicates a cause. In this sense, Mr Toland intitles his defence of Milton's life, *Amyntor*, as being a vindication of that work against Mr Blackhall and others, who had charged him with questioning the authority of some of the books of the New Testament, and declaring his doubt that several pieces under the name of Christ and his apostles, received now by the whole Christian church, were supposititious.

AMYOT (James), bishop of Auxerre and great almoner of France, was born of an obscure family at Melun, the 30th of October 1514, and studied philosophy at Paris, in the college of cardinal Le Moine. He was naturally dull and heavy; but diligence and application made amends for these natural defects. He left Paris at the age of twenty-three; and went to Bourges with the Sieur Colin, who had the abbey of St Ambrose in that city. At the recommendation of this abbot, a secretary of state took Amyot into his house to be tutor to his children. The great improvements they made under his direction induced the secretary to recommend him to the princess Margaret duchess of Berry, only sister of Francis I. and by means of this recommendation Amyot was made public professor of Greek and Latin in the University of Bourges. It was during this time he translated into French the "Amours of Theagines and Chariclea," which Francis I. was so pleased with, that he conferred upon him the abbey of Bellosane. He also translated Plutarch's Lives, which he dedicated to the king; and afterwards undertook that of Plutarch's Morals, which he ended in the reign of Charles IX. and dedicated to that prince. Charles conferred upon him the abbey of St Cornelius de Compiegne, and made him great almoner of France and bishop of Auxerre. He died in 1593, aged 79.

AMYRALDISM, a name given by some writers to the doctrine of universal grace, as explained and asserted by Amyraldus, or Moses Amyrault, and others his followers, among the reformed in France, towards the middle of the 17th century.

This doctrine principally consisted of the following particulars, viz. that God *desires* the happiness of all men, and none are excluded by a divine decree; that none can obtain salvation without faith in Christ; that God refuses to none the *power* of *believing*, though he does not grant to *all* his assistance, that they may improve this power to saving purposes; and that many perish through their own fault. Those who embraced this doctrine were called *Universalists*; though it is evident they rendered grace *universal* in words, but *partial* in reality, and are chargeable with greater inconsistencies than the *Supralapsarians*.

AMYRAULT (Moses), an eminent French Protestant divine, born at Bourgueil in Touraine in 1596. He studied at Saumur, where he was chosen professor of theology; and his learned works gained him the esteem of Catholics as well as Protestants, particularly of Cardinal Richelieu, who consulted him on a plan of re-uniting their churches, which, however, as may well be supposed, came to nothing. He published a piece in which he attempted to explain the mystery of predestination and grace, which occasioned a controversy between him and some other divines. He also wrote, An Apology for the Protestants; a Paraphrase on the New-Testament; and several other books. This eminent divine died in 1664.

AMYRIS: A genus of the monogynia order, belonging to the decandria class of plants. The characters are: The *calyx* is a small single-leaved perianthium, four-

four-toothed and persistent: The *corolla* consists of four oblong petals, concave and expanding: The *stamina* consist of eight erect subulated filaments; the antheræ are oblong, erect, and the length of the corolla: The *pistillum* has an ovate germen, above; a thickish stylus, the length of the stamina; and a four-cornered stigma: The *pericarpium* is a round drupaceous berry: The *seed* is a globular glossy nut.—The most remarkable species are: 1. The elemifera, or shrub which bears the gum-elemi, a native of South-America. It grows to the height of about six feet, producing trifoliated stiff shining leaves, growing opposite to one another on footstalks two inches long. At the ends of the branches grow four or five slender stalks set with many very small white flowers. 2. The giliadensis, or opobalsamum, is an evergreen shrub, growing spontaneously in Arabia-Felix, from whence the opobalsam, or balm of gilead, is procured. 3. Toxifera, or poison-wood, is a small tree, with a smooth light-coloured bark. Its leaves are winged; the middle rib is seven or eight inches long, with pairs of pinnæ one against another on inch-long footstalks. The fruit hangs in bunches, is shaped like a pear, and is of a purple colour, covering an oblong hard stone. From the trunk of this tree distils a liquid as black as ink. Birds feed on the fruit: particularly one, called the *purple grossbeak*, on the mucilage that covers the stone. It grows usually on rocks, in Providence, Ilathera, and others of the Bahama islands. 4. The balsamifera, or rose-wood, is found on gravelly hills in Jamaica and others of the West India islands. It rises to a considerable height, and the trunks are remarkable for having large protuberances on them. The leaves are laurel-shaped; the small blue flowers are on a branched spike; and the berries are small and black.

Plate XVII.

Properties. From the first species, which is called by the natives of the Brasils *icicariba*, is obtained the resin improperly called *gum-elemi*, or gum-lemon. This drug is brought to us from the Spanish West Indies, and sometimes from the East Indies, in long roundish cakes, generally wrapped up in flag leaves. The best sort is softish, somewhat transparent, of a pale whitish yellow colour, inclining a little to green, of a strong not unpleasant smell. It almost totally dissolves in pure spirit, and sends over some part of its fragrance along with this menstruum in distillation: distilled with water, it yields a considerable quantity of pale-coloured, thin, fragrant, essential oil. This resin gives name to one of the officinal unguents, and is at present scarce any otherwise made use of; though it is certainly preferable, for internal purposes, to some others which are held in greater esteem. The second species yields the balsam of Mecca, of Syria, or of Gilead, which is the most fragrant and pleasant of any of the balsams.

The true balsam tree is found near to Mecca, which is situated about a day's journey from the Red Sea, on the Asiatic side. It has a yellowish or greenish yellow colour, a warm bitterish aromatic taste, and an acidulous fragrant smell. It has long been held in great esteem. The Turks, who are in possession of the country in which it grows, value it much as an odoriferous unguent and cosmetic, and set such a high price upon it, that it is adulterated when it comes into the hands of the dealers, so that it is very difficult to get genuine specimens of it. It has been recommended in great variety of complaints; but now it is generally believed that the Canada and copaiva balsams are equally efficacious, and will answer every purpose for which it can be used. Dr Alston says, that the surest mark of this balsam being pure and unadulterated is, its spreading quickly on the surface of water when dropped into it; and that if a single drop of it is let fall into a large saucer full of water, it immediately spreads all over its surface, and as it were dissolves and disappears: but in about half an hour it becomes a transparent pellicle covering the whole surface, and may be taken up with a pin, having lost but its fluidity and colour, and become white and soft, cohering, and communicating its smell and taste to the water. This test, he says, all the balsam he saw in Holland bore, though it is rare to get any from London that answers it. The balsamifera, or rose-wood, affords an excellent timber: it is also replete with a fragrant balsam or oil, and retains its flavour and solidity though exposed to the weather many years. By subjecting this wood to distillation, Dr Wright thinks, a perfume equal to the oleum rhodii may probably be obtained.

ANA, among physicians, denotes a quantity equal to that of the preceding ingredient. It is abbreviated thus, āā, or ā.

ANA, in matters of literature, a Latin termination, adopted into the titles of several books in other languages.—*Anas*, or *books in ana*, are collections of the memorable sayings of persons of learning and wit; much the same with what we otherwise call *table-talk*.

Wolfius has given the history of books in ana, in the preface to the Casauboniana. He there observes, that though such titles be new, the thing itself is very old; that Xenophon's books of the deeds and sayings of Socrates, as well as the dialogues of Plato, are *Socratiana*; that the apophthegms of the philosophers collected by Diogenes Laertius, the sentences of Pythagoras and those of Epictetus, the works of Athenæus, Stobeus, and divers others, are so many anas. Even the Gemara of the Jews, with several other oriental writings, according to Wolfius, properly belong to the same class. To this head of ana may likewise be referred the Orphica, the Pythagoræa, Æsopica, Pyrrhonea, &c.

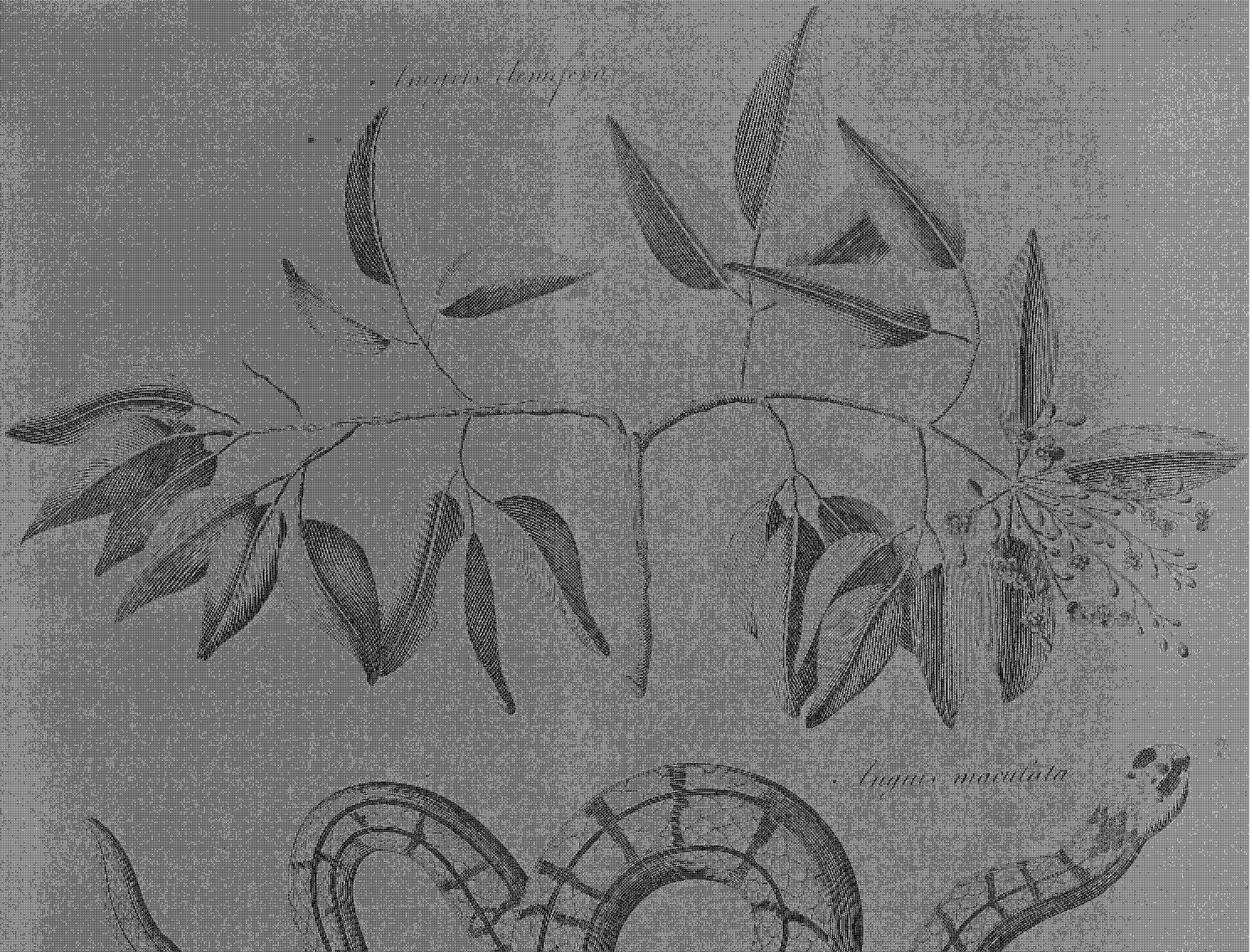
Scaligerana was the first piece that appeared with a title in ana. It was composed by Isan de Vassan, a young Champanois, recommended to Jos. Scaliger by Casaubon. Being much with Scaliger, who was daily visited by the men of learning at Leyden, De Vassan wrote down whatever things of any moment he heard Scaliger say. And thus arose the Scaligerana, which was not printed till many years after, at Geneva, in 1666. Patin. Let. 431.—Soon after came the Perroniana, Thuana, Naudæana, Patineana, Sorberiana, Menagiana, Anti-Menagiana, Furetiana, Chevræana, Leibnitziana, Arlequiniana, Poggiana, &c.

ANABAPTISTON, the same with ABAPTISTON.

ANABAPTISTS, a name which has been indiscriminately applied to Christians of very different principles and practices; though many of them object to the denomination, and hold nothing in common, besides the opinion that baptism ought always to be performed by immersion, and not administered before the age of discretion.

The word Anabaptist is compounded of ανα, "new,"

Plate XVII



Anabaptists.

and βαπτιστης, "a baptist;" and in this sense the Novatians, the Cataphrygians, and the Donatists, may be considered as a kind of Anabaptists in the earlier ages, though not then denoted by this name; for they contended, that those Christians of the Catholic church who joined themselves to their respective parties should be rebaptized. But we must not class under the same denomination those bishops of Asia and Africa, who, in the third century, maintained, that baptism administered by those whom they called heretics was not valid, and therefore that such as returned into their churches ought to be rebaptized. Nor do the English and Dutch Baptists consider the denomination as at all applicable to their sect: by whom the baptism appointed by Christ is held to be "nothing short of *immersion, upon a personal profession of faith:*" of which profession infants being incapable, and sprinkling being no adaquate symbol of the thing intended, the baptizing of proselytes to their communion, who in their infancy had undegone the ceremony of sprinkling, cannot, it is urged, be interpreted a repetition of the baptismal ordinance.

Anabaptists, in a strict and proper sense, appear to be those who not only rebaptize, when they arrive at an adult age, persons that were baptized in their infancy, but also, as often as any person comes from one of their sects to another, or as often as any one is excluded from their communion and again received into the bosom of their church, they baptize him. And such were many of the German Baptists. But the single opinion common to all the sects to which the name of *Anabaptists* has been indiscriminately applied, is that of the invalidity of *infant baptism*, in whatever way administered: And hence the general denomination of *Antipædobaptists*; which includes Anabaptists, Baptists, Mennonites, Waterlandians, &c. as distinguished by their respective peculiarities: though *Anabaptists* seem to have been adopted by most writers as the general term.

To the above peculiar notion concerning the baptismal sacrament the Anabaptists added principles of a different nature, depending upon certain ideas which they entertained concerning a perfect church-establishment, pure in its members, and free from the institutions of human policy.

The Anabaptists appear to have made little noise, or to have been little noticed before the time of the reformation in Germany. The most prudent and rational part of them considered it possible, by human wisdom, industry, and vigilance, to purify the church from the contagion of the wicked, provided the manners and spirit of the primitive Christians could but recover their lost dignity and lustre; and seeing the attempts of Luther, seconded by several persons of eminent piety, prove so successful, they hoped that the happy period was arrived in which the restoration of the church to purity was to be accomplished, under the divine protection, by the labours and counsels of pious and eminent men. Others, far from being satisfied with the plan of reformation proposed by Luther, looked upon it as much beneath the sublimity of their views; and consequently undertook a more perfect reformation, or, to express more properly their visionary enterprise, they proposed to found a new church, entirely spiritual, and truly divine.

This sect was soon joined by great numbers, and (as usually happens in sudden revolutions of this nature) by many persons whose characters and capacities were very different, though their views seemed to turn upon the same object. Their progress was rapid; for, in a very short space of time, their discourses, visions, and predictions, excited commotions in a great part of Europe and drew into their communion a prodigious multitude, whose ignorance rendered them easy victims to the illusions of enthusiasm. The most pernicious faction of all those which composed this motley multitude, was that which pretended that the founders of the new and *perfect church*, already mentioned, were under the direction of a divine impulse, and were armed against all opposition by the power of working miracles. It was this faction that, in the year 1521, began their fanatical work, under the guidance of Munzer, Stubner, Storck, &c.

These persons were disciples of Luther: but well knowing that their opinions were such as would receive no sanction from him, they availed themselves of his absence to disseminate them in Wittemburgh, and had the address to over-reach the piety of Melancthon. Their principal purpose was to gain over the populace, and to form a considerable party. To effect this, says Bayle, they were industrious and active, each in his own way. Storck, wanting knowledge, boasted of inspiration; and Stubner, who had both genius and erudition, laboured at commodious explications of Scripture. Not content with discrediting the court of Rome, and decrying the authority of consistories, they taught, That among Christians, who had the precepts of the gospel to direct and the Spirit of God to guide them, the office of magistracy was not only unnecessary, but an unlawful encroachment on their spiritual liberty; that the distinctions occasioned by birth, or rank, or wealth, being contrary to the spirit of the gospel, which considers all men as equal, should be entirely abolished; that all Christians, throwing their possessions into one common stock, should live together in that state of equality which becomes members of the same family; that, as neither the laws of nature nor the precepts of the New Testament had placed any restraint upon men with regard to the number of wives which they might marry, they should use that liberty which God himself had granted to the patriarchs.

They employed at first the various arts of persuasion in order to propagate their doctrine. They preached, exhorted, admonished, and reasoned in a manner that seemed proper to impress the multitude; and related a great number of visions and revelations with which they pretended to have been favoured from above. But when they saw that these methods of making proselytes were not attended with such a rapid success as they fondly expected, and that the ministry of Luther and other eminent reformers were detrimental to their cause, they then had recouse to more expeditious measures, and madly attempted to propagate their fanatical doctrine by force of arms. Munzer and his associates, in the year 1525, put themselves at the head of a numerous army, composed for the most part of the peasants of Suabia, Thuringia, Franconia, and Saxony, and declared war against all laws, government, and magistrates of every kind, under the chimerical

merical pretext that Christ was now to take the reins of civil and ecclesiastical government into his own hands, and to rule alone over the nations. But this seditious crowd was routed and dispersed, without much difficulty, by the Elector of Saxony and other princes; and Munzer their ringleader ignominiously put to death, and his factious counsellors scattered abroad in different places.

Many of his followers, however, survived, and propagated their opinions through Germany, Switzerland, and Holland. In the year 1533, a party of them settled at Munster under the direction of two Anabaptist prophets, John Matthias a baker of Haerlem, and John Bockholdt a journeyman-taylor of Leyden. Having made themselves masters of the city, they deposed the magistrates, confiscated the estates of such as had escaped, and deposited the wealth they amassed together in a public treasury for common use. They made preparations of every kind for the defence of the city; and sent out emissaries to the Anabaptists in the Low Countries, inviting them to assemble at Munster, which was now dignified with the name of Mount Sion, that from hence they might be deputed to reduce all the nations of the earth under their dominion. Matthias, who was the first in command, was soon cut off in an act of phrenfy by the bishop of Munster's army; and was succeeded by Bockholdt, who was proclaimed by a special designation of Heaven, as he pretended, king of Sion, and invested with legislative powers like those of Moses. The extravagances of Bockholdt were too numerous to be recited: it will be sufficient to add, that the city of Munster was taken after a long siege and an obstinate resistance; and Bockholdt, the mock monarch, was punished with a most painful and ignominious death.

It must, however, be acknowledged that the true rise of the numerous insurrections of this period ought not to be attributed to religious opinions. The first insurgents groaned under the most grievous oppressions; they took up arms principally in defence of their civil liberties; and of the commotions that took place. The Anabaptist leaders abovementioned seem rather to have availed themselves, than to have been the prime movers. See the article REFORMATION.—That a great part of the main body, indeed, consisted of Anabaptists seems indisputable; and whatever fanaticism existed among them would naturally be called forth or be inflamed by the situations that occurred, and run riot in its wildest shapes. At the same time it appears from history, that a great part also consisted of Roman-Catholics, and a still greater of persons who had scarcely any religious principles at all. Indeed, when we read of the vast numbers that were concerned in those insurrections, of whom it is reported that 100,000 fell by the sword, it appears reasonable to conclude that a great majority of them were not Anabaptists.

Before concluding this article, it must be remarked, that the Baptists or Mennonites in England and Holland are to be considered in a very different light from the enthusiasts we have been describing: and it appears equally uncandid and invidious, to trace up their distinguishing sentiment, as some of their adversaries have done, to those obnoxious characters, and there to stop, in order as it were to associate with it the ideas of turbulence and fanaticism, with which it certainly has no natural connection. Their coincidence with some of those oppressed and infatuated people in denying baptism to infants, is acknowledged by the Baptists: but they disavow the practice which the appellation of *Anabaptists* implies; and their doctrines seem referable to a more ancient and respectable origin. They appear supported by history in considering themselves as the descendants of the Waldenses, who were so grievously oppressed and persecuted by the despotic heads of the Romish hierarchy; and they profess an equal aversion to all principles of rebellion on one hand, and to all suggestions of fanaticism on the other. See BAPTISTS.—The denomination of *Mennonites*, by which they are distinguished in Holland, they derive from Menno, the famous man who latterly gave consistence and stability to their sect. See MENNONITES.

ANABASII, in antiquity, were couriers who were sent on horseback, or in chariots, with dispatches of importance.

ANABATHRA, in ancient writers, denote a kind of steps or ladder whereby to ascend to some eminence. In this sense we read of the anabathra of theatres, pulpits, &c. Anabathra appears to have been sometimes also applied to ranges of seats rising gradually over each other.

ANABATHRA is more particularly applied to a kind of stone blocks raised by the high-way sides, to assist travellers in mounting or alighting, before the use of stirrups was invented.—The first author of this contrivance among the Romans was C. Gracchus brother of Tiberius.

ANABLEPS, in ichthyology, the trivial name of a species of cobitis. See COBITIS.

ANABOA, a small island situated near the coast of Loango in Africa, in E. Long. 9°. N. Lat. 1°. Here are several fertile valleys, which produce plenty of bananas, oranges, pine-apples, lemons, citrons, tamarinds, cocoa-nuts, &c. together with vast quantities of cotton. In this island are two high mountains, which, being continually covered with clouds, occasion frequent rains.

ANABOLÆUM, or ANABOLE, in antiquity, a kind of great or upper coat, worn over the tunica.

ANABOLEUS, in antiquity, an appellation given to grooms of the stable, or equerries, who assisted their masters in mounting their horses. As the ancients had no stirrups, or instruments that are now in use for mounting a horse, they either jumped upon his back, or were aided in mounting by anabolei.

ANACALYPTERIA, according to Suidas, were presents made to the bride by her husband's relations and friends when she first uncovered her face and showed herself to men. These presents were also called επαυλαια: for among the Greeks, virgins before marriage were under strict confinement, being rarely permitted to appear in public, or converse with the other sex; and when allowed that liberty, wore a veil over their faces termed Καλυπτρον, or Καλυπτρα, which was not left off in the presence of men till the third day after marriage; whence, according to Hesychius, this was also called *anacalypterion*.

ANA-

ANACAMPSEROS, in botany, a synonime of the portulaca and several other plants.

ANACAMPTERIA, in ecclesiastical antiquity, a kind of little edifices adjacent to the churches, designed for the entertainment of strangers and poor persons.

ANACAMPTIC, a name applied by the ancients to that part of optics which treats of reflexion, being the same with what is now called CATOPTRICS.

ANACARDIUM, or CASHEW-NUT TREE: A genus of the monogynia order, belonging to the decandria class of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The characters are: The *calyx* is divided into five parts, the divisions ovate and deciduous: The *corolla* consists of five reflected petals, twice the length of the calyx: The *stamina* consist of ten capillary filaments shorter than the calyx, one of them castrated; the antheræ are small and roundish: The *pistillum* has a roundish germen: the stylus is subulated, inflected, and the length of the corolla; the stigma oblique: There is no *pericarpium;* the receptaculum is very large and fleshy: The *seed* is a large kidney-shaped nut, placed above the receptaculum.

Of this only one species is as yet known to the botanists, viz. the occidentale. It grows naturally in the West Indies, and arrives at the height of 20 feet in those places of which it is a native. The fruit of this tree is as large as an orange; and is full of an acid juice, which is frequently made use of in making punch. To the apex of this fruit grows a nut, of the size and shape of a hare's kidney, but much larger at the end which is next the fruit than at the other. The shell is very hard; and the kernel, which is sweet and pleasant, is covered with a thin film. Between this and the shell is lodged a thick, blackish, inflammable liquor, of such a caustic nature in the fresh nuts, that if the lips chance to touch it, blisters will immediately follow. The kernels are eaten raw, or pickled. The caustic liquor just mentioned is esteemed an excellent cosmetic with the West India young ladies, but they must certainly suffer a great deal of pain in its application; and, fond as our females are of a beautiful face, it is highly probable they would never submit to be flayed alive to obtain one. When any of the former fancy themselves too much tanned by the scorching rays of the sun, they gently scrape off the thin outside of the stone, and then rub their faces all over with the stone. Their faces immediately swell and grow black; and the skin being poisoned by the caustic oil abovementioned, will, in the space of five or six days, come entirely off in large flakes, so that they cannot appear in public in less than a fortnight; by which time the new skin looks as fair as that of a new-born child. The negroes in Brazil cure themselves effectually of disorders in the stomach by eating of the yellow fruit of this tree; the juice of which, being acid, cuts the tough humours which obstructed the free circulation of the blood, and thus removes the complaint. This cure, however, is not voluntary: for their masters, the Portuguese, deny them any other sustenance; and letting them loose to the woods, where the cashew-nuts grow in great abundance, leave it in their option to perish by famine or sustain themselves with this fruit. The milky juice of this tree will stain linen of a good black, which cannot be washed out. See Plate XVIII.

Culture. This plant is easily raised from the nuts, which should be planted each in a separate pot filled with light sandy earth, and plunged into a good hot-bed of tanners bark; they must also be kept from moisture till the plants come up, otherwise the nuts are apt to rot. If the nuts are fresh, the plants will come up in about a month.

ANACEPHALÆOSIS, in rhetoric, the same with recapitulation. See RECAPITULATION.

ANACHARSIS, a famous Scythian philosopher, conversed with Solon, and lived an austere life. Upon his return from his travels through Greece, he attempted to change the ancient customs of Scythia, and to establish those of Greece; which proved fatal to him. The king shot him dead in the wood with an arrow. A great many statues were erected to him after his death. He is said to have invented tinder, the anchor, and the potter's wheel; but the latter is mentioned by Homer, who lived long before him. Anacharsis flourished in the time of Crœsus.

ANACHORET, in church history, denots a hermit, or solitary monk, who retires from the society of mankind into some desart, with a view to avoid the temptations of the world, and to be more at leisure for meditation and prayer. Such were Paul, Anthony, and Hilarion, the first founders of monastic life in Egypt and Palestine.

Anachorets, among the Greeks, consist principally of monks, who retire to caves or cells, with the leave of the abbot, and an allowance from the monastery; or who, weary of the fatigues of the monastery, purchase a spot of ground, to which they retreat, never appearing again in the monastery, unless on solemn occasions.

ANACHRONISM, in matters of literature, an error with respect to chronology, whereby an event is placed earlier than it really happened.—The word is compounded of ανα, "higher," and χρονος, "time." Such is that of Virgil, who placed Dido in Africa at the time of Æneas, though in reality she did not come there till 300 years after the taking of Troy.—An error on the other side, whereby a fact is placed later and lower than it should be, is called a *parachronism.*

ANACLASTIC GLASSES, a kind of sonorous phials or glasses, chiefly made in Germany, which have the property of being flexible; and emitting a vehement noise by the human breath.—They are also called *vexing glasses* by the Germans *(vexier glaser)*, on account of the fright and disturbance they occasion by their resilition.—The anaclastic glasses are a low kind of phials, with flat bellies, resembling inverted funnels, whose bottoms are very thin, scarce surpassing the thickness of an onion peel: this bottom is not quite flat, but a little convex. But upon applying the mouth to the orifice, and gently inspiring, or as it were sucking out the air, the bottom gives way with a prodgious crack, and of convex becomes concave. On the contrary, upon exspiring or breathing gently into the orifice of the same glass, the bottom with no less noise bounds back to its former place, and become gibbous as before.—The anaclastic glasses first taken notice of were

were in the castle of Goldbach; where one of the academists *Naturæ Curiosorum*, having seen and made experiments on them, published a piece expresly on their history and phenomena. They are all made of a fine white glass. It is to be observed of these, 1. That if the bottom be concave at the time of inspiration, it will burst; and the like will happen if it be convex at the time of exspiration. 2. A strong breath will have the same effect even under the contrary circumstances.

ANACLASTICS, that part of optics which considers the refraction of light, and is commonly called *Dioptrics*. See DIOPTRICS.

ANACLETERIA, in antiquity, a solemn festival celebrated by the ancients when their kings or princes came of age, and assumed the reins of government. It was so called, because proclamation being made of this event to the people, they went to salute their prince during the anacleteria, and to congratulate him upon his new dignity.

ANACLETICUM, in the ancient art of war, a particular blast of the trumpet, whereby the fearful and flying soldiers were rallied and recalled to the combat.

ANACLINOPALE, Ανακλινοπαλη, in antiquity, a kind of wrestling, wherein the champions threw themselves voluntarily on the ground, and continued the combat by pinching, biting, scratching, and other methods of offence. The *Anaclinopale* was contradistinguished from the *Orthopale*, wherein the champions stood erect. In the *Anaclinopale*, the weaker combatants sometimes gained the victory.

ANACLINTERIA, in antiquity, a kind of pillows on the dining-bed, whereon the guests used to lean. The ancient tricliniary beds had four pillows, one at the head, another at the feet, a third at the back, and a fourth at the breast. That on which the head lay, was properly called by the Greeks ανακλιτηριον, or ανακλιντρον; by the Romans *fulcrum*, sometimes *pluteus*.

ANACOLLEMA, a composition of astringent powders, applied by the ancients to the head, to prevent defluctions on the eyes.

ANACONDO, in natural history, is a name given in the isle of Ceylon to a very large and terrible rattlesnake, which often devours the unfortunate traveller alive, and is itself accounted excellent and delicious fare.

ANACREON, a Greek poet, born at Teos, a city of Ionia, flourished about 532 years before the Christian æra. Polycrates, tyrant of Samos, invited him to his court, and made him share with him in his business and his pleasures. He had a delicate wit, as may be judged from the inexpressible beauties and graces that shine in his works: but he was fond of pleasure, was of an amorous disposition, and addicted to drunkenness: yet, notwithstanding his debaucheries, he lived to the age of 85; when, we are told, he was choaked by a grape-stone which stuck in his throat as he was regaling on some new wine.

There is but a small part of Anacreon's works that remain; for, besides his odes and epigrams, he composed elegies, hymns, and iambics. His poems which are extant were rescued from oblivion by Henry Stephens, and are universally admired. The verses of Anacreon are sweeter, says Scaliger, than Indian sugar. His beauty and chief excellence, says Madam Dacier, lay in imitating nature, and in following reason; so that he presented to the mind no images but what were noble and natural. The odes of Anacreon says Rapin, are flowers, beauties, and perpetual graces; it is familiar to him to write what is natural and to the life, he having an air so delicate, so easy, and graceful, that among all the ancients there is nothing comparable to the method he took, nor to that kind of writing he followed. He flows soft and easy, every where diffusing the joy and indolence of his mind through his verse, and tuning his harp to the smooth and pleasant temper of his soul. But none has given a juster character of his writings than the God of Love, as taught to speak by Mr Cowley:

> All thy verse is softer far
> Than the downy feathers are,
> Of my wings, or of my arrows,
> Of my mother's doves and sparrows:
> Graceful, cleanly, smooth, or round,
> All with Venus' girdle bound.

ANACREONTIC VERSE, in ancient poetry, a kind of verse so called from its being much used by the poet Anacreon. It consists of three feet and an half, usually spondees and iambuses, and sometimes anapests: Such is that of Horace,

Lydia, dic per omnes.

ANACRISIS, among the ancient Greeks, is used for a kind of trial or examination, which the archons, or chief magistrates of Athens, were to undergo before their admission into that office. The *Anacrisis* stands distinguished from the *docimasia*, which was a second examination, in the forum. The anacrysis was performed in the senate-house. The questions here proposed to them were concerning their family, kindred, behaviour, estate, &c. Some will have it that all magistrates underwent the anacrisis.

ANACRISIS, among civilians, an investigation of truth, interrogation of witnesses, and inquiry made into any fact, especially by torture.

ANACROSIS, in antiquity, denotes a part of the Pythian song, wherein the combat of Apollo and Python are described.—The anacrosis was the first part, and contained the preparation to the fight.

ANACYCLUS, in botany: a genus of the polygamia superflua order, belonging to the syngenesia class of plants; and, in the natural method, ranking under the 49th order, *Compositæ-discoides*. The characters are: The *calyx* is hemispheric and imbricated: The *corolla* is radicated: The *stamina* consist of fine very short capillary filaments; the anthera cylindric and tubular: The *pistillum* has an oval germen: a filiform stylus; a bifid stigma in the hermaphrodites, two slender reflected stigmata in the females: There is no *pericarpium*; but the calyx unchanged: The *seeds* are solitary, with membranous wings; the *receptaculum* is chaffy.

ANADAVADÆA, in ornithology, a barbarous name of a species of alauda. See ALAUDA.

ANADEMA, among the ancients, denotes an ornament

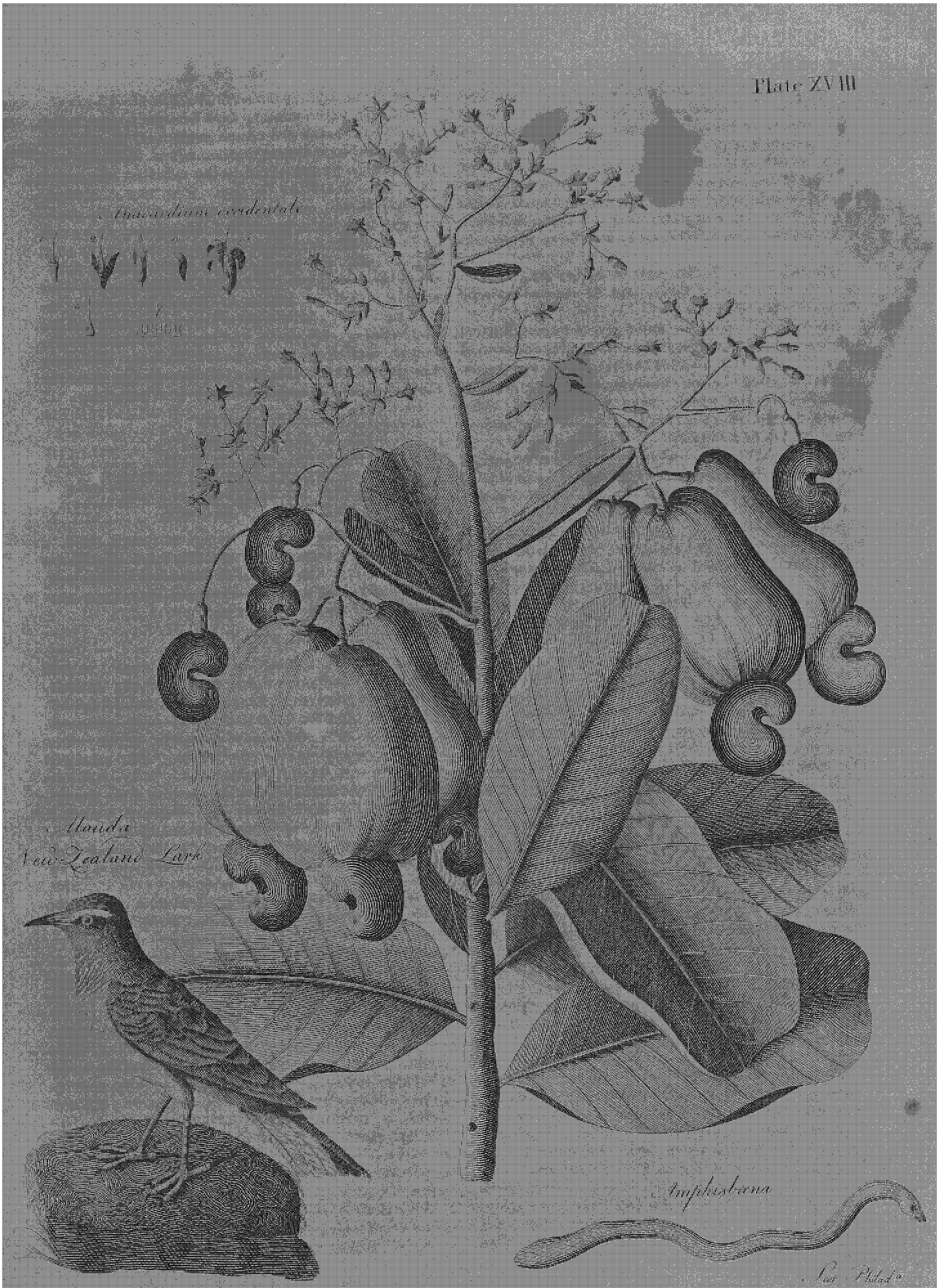


Plate XVIII
Anacardium occidentale
Alouda
New Zealand Lark
Amphisbaena

nament of the head, wherewith victors at the sacred games had their temples bound.

ANADIPLOSIS, in rhetoric and poetry, a repetition of the last word of a line or clause of a sentence, in the beginning of the next: Thus,

> *Pierides, vos hæc facietis maxima Gallo:*
> *Gallo cujus amor,* &c.
> *Et matutinis accredula vocibus instat,*
> *Vocibus instat, & assiduas jacit ore querelas.*

ANADROMOUS, among ichthyologists, a name given to such fishes as go from the sea to the fresh waters at stated seasons, and return back again; such as the salmon, &c. See SALMO.

ANADUOMENE VENUS, in the Grecian mythology, answered to the Sea-Venus in the Roman, and was the appellation given to one of the chief deities of the sea. The most celebrated picture in all antiquity was that of this goddess by Apelles; and the famous Venus of Medici is a Sea-Venus.

ANÆDEIA, in antiquity, a denomination given to a silver stool placed in the Areopagus, on which the defendant, or person accused, was seated for examination. The word is Greek, Αναιδεια, which imports imprudence; but according to Junius's correction, it should rather be Αναιτια, q. d. *innocence*. The plaintiff, or accuser, was placed on an opposite stool called *hybris*, or injury; here he proposed three questions to the party accused, to which positive answers were to be given. The first, Are you guilty of this fact? The second, How did you commit the fact? The third, Who were your accomplices?

ANÆSTHESIA, signifies a privation of the senses.

ANAGALLIS, PIMPERNEL: A genus of the monogynia order, belonging to the pentandria class of plants; and, in the natural method, ranking under the 20th order, *Rotaceæ*. The characters are: The *calyx* is a quinquepartite perianthium, which is persistent: The *corolla* consists of one rotated petal: The *stamina* consist of five erect filaments shorter than the corolla; the antheræ are simple: The *pistillum* has a globular germen; the stylus slightly declinated, the stigma headed: The *pericarpium* is a globular capsule, unilocular and circumcised: The *seeds* are numerous and angled; the receptaculum globular and very large. Of this there are four

Species. 1. The arvensis, or common pimpernel, with a red flower. 2. The fæmina, with a blue flower. 3. The monelli, or narrow-leaved pimpernel. 4. The latifolia, or Spanish pimpernel.—The first sort is very common in corn-fields, and other cultivated places in Britain. The second is sometimes found wild in the fields, but is not so common as the first. The third is a beautiful small perennial plant, and produces numbers of fine blue flowers. The fourth is a native of Spain, and likewise produces blue flowers.

The plants are very easily propagated by seeds; and if suffered to remain till their seeds scatter, they become troublesome weeds.—The arvensis is not unfrequently taken as food; it makes no unpleasant salad, and in some parts of Great Britain is a common pot-herb. All the species are eat by cows and goats, but refused by sheep; small birds are greatly delighted with the seeds.—Great medicinal virtues were formerly expected from the first two species; but they are now justly disregarded.

ANAGNIA, (anc. geog.), a town of Latium, capital of the Hernici; which after a faint resistance, submitting to the Romans, was admitted to the freedom of the city, yet without the right of suffrage, (Livy). It was afterwards a colony of Drusus Cæsar, and walled round, and its territory assigned to the veterans, (Frontinus.) Here Antony married Cleopatra, and divorced Octavia. Now *Anagni*, 36 miles to the east of Rome. E. Long. 13. 45. Lat. 42. 48.

ANAGNOSTA, or ANAGNOSTES, in antiquity, a kind of literary servant, retained in the families of persons of distinction, whose chief business was to read to them during meals, or at any other time when they were at leisure. Cornelius Nepos relates of Atticus, that he had always an anagnostes at his meals. He never supped without reading; so that the minds of his guests were no less agreeably entertained than their appetites. The same custom, Eginhard observes, was kept up by Charlemagne, who at table had the histories and acts of ancient kings read to him. This custom seems to have been a relic of that of the ancient Greeks, who had the praises of great men and heroes sung to them while at table. The ancient monks and clergy kept up the like usage, as we are informed by St Augustin.

ANAGOGICAL, signifies mysterious, transporting; and is used to express whatever elevates the mind, not only to the knowledge of divine things, but of divine things in the next life. This word is seldom used, but with regard to the different senses of Scripture. The anagogical sense is, when the sacred text is explained with a regard to eternal life, the point which Christians should have in view: for example, the rest of the sabbath, in the anagogical sense, signifies the repose of everlasting happiness.

ANAGOGY, or ANAGOGE, among ecclesiastical writers, the elevation of the mind to things celestial and eternal.—It is particularly used, where words, in their natural and primary meaning, denote something sensible, but have a further view to something spiritual or invisible.

ANAGOGY, in a more particular sense, denotes the application of the types and allegories of the Old Testament to subjects of the New; thus called, because the veil being here drawn, what before was hidden, is exposed to open sight.

ANAGRAM (from the Greek ανα *backwards*, and γραμμα *letter*), in matters of literature, a transposition of the letters of some name, whereby a new word is formed, either to the advantage or disadvantage of the person or thing to which the name belongs. Thus, the anagram of Galenus is *angelus*; that of Logica, *caligo*; that of Alstedius, *sedulitas*; that of Loraine is *alerion*, on which account it was that the family of Loraine took *alerions* for their armoury.—Calvin, in the title of his *Institutions*, printed at Strasburg in 1539, calls himself *Alcuinus*, which is the anagram of Calvinus, and the name of an eminently learned person in the time of Charlemagne, who contributed greatly to the restoration of learning in that age.

Those who adhere strictly to the definition of an anagram, take no other liberty than that of omitting or or retaining the letter H, at pleaſure; whereas others make no ſcruple to uſe E for Æ, V for W, S for Z, and C for K; and *vice verſa*.

Beſides anagrams formed as above, we meet with another kind in ancient writers, made by dividing a ſingle word into ſeveral; thus *ſus tinea mus*, are formed out of the word *ſuſtineamus*.

Anagrams are ſometimes alſo made out of ſeveral words: ſuch is that on the queſtion put by Pilate to our Saviour, *Quid eſt veritas?* whereof we have this admirable anagram, viz. *Eſt vir qui adeſt*.

The Cabaliſts among the Jews are profeſſed anagrammatiſts; the third part of their art, which they call *themuru*, i. e. "changing," being nothing but the art of making anagrams, or of finding hidden and myſtical meanings in names; which they do by changing, tranſpoſing, and differently combining, the letters of thoſe names.—Thus, of נח the letters of Noah's name, they make חן *grace*; of משיח *the Meſſiah*, they make ישמח *he ſhall rejoice*.

ANAGRAMMATIST, a maker or compoſer of anagrams. Thomas Billon, a provincial, was a celebrated anagrammatiſt, and retained by Lewis XIII. with a penſion of 1200 livres, in quality of anagrammatiſt to the king.

ANAGROS, in commerce, a meaſure for grain uſed in ſome cities in Spain, particularly at Seville; 46 anagros make about $10\frac{1}{4}$ quarters of London.

ANAGYRIS, STINKING BEAN-TREFOIL: A genus of the monogynia order, belonging to the decandria claſs of plants; and, in the natural method, ranking under the 32d order, *Papilionaceæ*. The characters are: The *calyx* is a bell-ſhaped perianthium: The *corolla* is papilionaceous; the vexillum cordated, ſtraight, emarginated, and twice as long as the calyx; the alæ ovate and longer than the vexillum; the carina ſtraight and very long: The *ſtamina* conſiſt of 10 filaments; the antheræ ſimple: The *piſtillum* has an oblong germen, a ſimple ſtylus, and a villous ſtigma: The *pericarpium* is an oblong legumen: The *ſeeds* are ſix or more, and kidney-ſhaped.

Of this genus there is but one ſpecies, the fetida, which grows naturally in the ſouthern parts of Europe. It is a ſhrub which uſually riſes to the height of eight or ten feet, and produces its flowers in April or May. Theſe are of a bright yellow colour, growing in ſpikes, ſomewhat like the labrunum.

Culture. This plant may be propagated either by ſeeds, or by laying down the tender branches in the ſpring; but the firſt method is preferable. The ſeeds ſhould be ſown towards the end of March in pots filled with light earth, and plunged in a gentle hot-bed. The plants uſually appear in a month, when they ſhould be gradually inured to the open air, that they may be hardened before winter. In the autumn and winter, they muſt be ſheltered under a hot-bed frame: the ſpring following, they muſt be tranſplanted, each into a ſeparate ſmall pot, placed in a ſheltered ſituation, and again removed into a frame to ſhelter them during the following winter. The ſecond ſpring after the plants come up, ſome of them may be taken out of the pots, and planted in a border near a ſouth wall, where, if they are protected in winter, they may remain.

ANAGYRIS or ANAGYRUS, the name of a place in Attica, of the tribe Erechtheis, where a fetid plant, called *Anagyris*, probably the ſame with the foregoing, grew in great plenty, (Dioſcorides, Pliny, Stephanus;) and the more it was handled, the ſtronger it ſmelled: hence *commovere anagyrin* (or *anagyrum*), is to bring a misfortune on one's ſelf, (Ariſtophanes.)

ANAK, the father of the Anakims, was the ſon of Arba, who gave his name to Kirjath-arba, or Hebron, Joſh. xiv. 15. Anak had three ſons, Sheſhai, Ahiman, and Talmai, (chap. xv. 14. and Numb. xiii. 22.) who, as well as their father, were giants, and who, with their poſterity, all terrible for their fierceneſs and extraordinary ſtature, were called the *Anakims*; in compariſon of whom the Hebrews, who were ſent to view the land of Canaan, reported that they were but as graſshoppers. Numb. xiii. *ult*. Caleb, aſſiſted by the tribe of Judah, took Kirjath-arba, and deſtroyed the Anakims, (Judges i. 20. and Joſh. xv. 14.) in the year of the world 2559.

ANALECTA, or ANALECTES, in antiquity, a ſervant whoſe employment it was to gather up the off-falls of tables.

ANALECTA, *Analects*, in a literary ſenſe, is uſed to denote a collection of ſmall pieces; as eſſays, remarks, &c.

ANALEMMA, in geometry, a projection of the ſphere on the plane of the meridian, orthographically made by ſtraight lines and ellipſes, the eye being ſuppoſed at an infinite diſtance, and in the eaſt, or weſt, points of the horizon.

ANALEMMA, denotes likewiſe an inſtrument of braſs or wood, upon which this kind of projection is drawn with an horizon and curſor fitted to it, wherein the ſolſtitial colure, and all circles parallel to it, will be concentric circles; all circles oblique to the eye, will be ellipſes; and all circles whoſe planes paſs through the eye, will be right lines. The uſe of this inſtrument is to ſhow the common aſtronomical problems; which it will do, though not very exactly, unleſs it be very large.

ANALEPSIS, the augmentation or nutrition of an emaciated body.

ANALEPTICS, reſtorative or nouriſhing medicines.

ANALOGY, in philoſophy, a certain relation and agreement between two or more things, which in other reſpects are entirely different.

There is likewiſe an analogy between beings that have ſome conformity or reſemblance to one another; for example, between animals and plants; but the analogy is ſtill ſtronger between two different ſpecies of certain animals.

Analogy enters much into all our reaſoning, and ſerves to explain and illuſtrate. A great part of our philoſophy, indeed, has no other foundation than analogy.

It is natural for mankind to judge of things leſs known, by ſome ſimilitude, real or imaginary, between them and things more familiar or better known. And where the things compared have really a great ſimilitude in their nature, when there is reaſon to think that they are ſubject to the ſame laws, there may be a a considerable degree of probability in conclusions drawn from analogy. Thus we may observe a very great similitude between this earth which we inhabit, and the other planets, Saturn, Jupiter, Mars, Venus, and Mercury. They all revolve round the sun, as the earth does, although at different distances, and in different periods. They borrow all their light from the sun, as the earth does. Several of them are known to revolve round their axis like the earth, and, by that means, must have a like succession of day and night. Some of them have moons, that serve to give them light in the absence of the sun, as our moon does to us. They are all, in their motions, subject to the same law of gravitation, as the earth is. From all this similitude, it is not unreasonable to think, that those planets may, like our earth, be the habitation of various orders of living creatures. There is some probability in this conclusion from analogy.

But it ought to be observed, that, as this kind of reasoning can afford only probable evidence at best; so, unless great caution be used, we are apt to be led into error by it. To give an instance of this: Anatomists in ancient ages, seldom dissected human bodies; but very often the bodies of those quadrupeds whose internal structure was thought to approach nearest to that of the human body. Modern anatomists have discovered many mistakes the ancients were led into, by their conceiving a greater similitude between the structure of men and of some beasts than there is in reality.

Reid on the Intellectual Powers, Essay I. ch. iv. p. 52.

Perhaps no author has made a more just and a more happy use of his mode of reasoning, than Bishop Butler in his Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature. In that excellent work, the author does not ground any of the truths of religion upon analogy, as their proper evidence. He only makes use of analogy to answer objections against them. When objections are made against the truths of religion, which may be made with equal strength against what we know to be true in the course of nature, such objections can have no weight.

Analogical reasoning, therefore, may be of excellent use in answering objections against truths which have other evidence. It may likewise give a greater or a less degree of probability in cases where we can find no other evidence. But all arguments drawn from analogy are still the weaker, the greater disparity there is between the things compared; and therefore must be weakest of all when we compare body with mind, because there are no two things in nature more unlike.

There is no subject in which men have always been so prone to form their notions by analogies of this kind, as in what relates to the mind. We form an early acquaintance with material things by means of our senses, and are bred up in a constant familiarity with them. Hence we are apt to measure all things by them; and to ascribe to things most remote from matter the qualities that belong to material things. It is for this reason that mankind have, in all ages, been so prone to conceive the mind itself to be some subtle kind of matter: That they have been disposed to ascribe human figure, and human organs, not only to angels, but even to the Deity.

To illustrate more fully that analogical reasoning from a supposed similitude of mind to body, which appears to be the most fruitful source of error with regard to the operations of our minds, the following instance may be given. When a man is urged by contrary motives, those on one hand inciting him to do some action, those on the other to forbear it; he deliberates about it, and at last resolves to do it, or not to do it. The contrary motives are here compared to the weights in the opposite scales of balance; and there is not perhaps any instance that can be named of a more striking analogy between body and mind. Hence the phrases of weighing motives, of deliberating upon actions, are common to all languages.

From this analogy some philosophers draw very important conclusions. They say, that as the balance cannot incline to one side more than the other, when the opposite weights are equal; so a man cannot possibly determine himself if the motives on both hands are equal; and as the balance must necessarily turn to that side which has most weight, so the man must necessarily be determined to that hand where the motive is strongest. And on this foundation some of the schoolmen maintained, that if a hungry ass were placed between two bundles of hay equally inviting, the beast must stand still and starve to death, being unable to turn to either, because there are equal motives to both. This is an instance of that analogical reasoning, which, it is conceived, ought never to be trusted; for the analogy between a balance and a man deliberating, though one of the strongest that can be found between matter and mind, is too weak to support any argument. A piece of dead inactive matter, and an active intelligent being, are things very unlike; and because the one would remain at rest in a certain case, it does not follow that the other would be inactive in a case somewhat similar. The argument is no better than this, that, because a dead animal moves only as it is pushed, and, if pushed with equal force in contrary directions, must remain at rest; therefore the same thing must happen to a living animal; for surely the similitude between a dead animal and a living, is as great as that between a balance and a man.

The derivation of the word Analogy indicates, as professor Castillon of Berlin* observes, a resemblance discernible by reason. This is confirmed by the sense in which the term is used in geometry, where it signifies an equality of ratios.—In explaining this subject, it is observed, there may be a resemblance between sensations and a resemblance between perceptions: the former is called *physical resemblance*, because it acts upon the physical or sensitive faculty; the latter *moral resemblance*, because it affects the moral or rational faculty of man.

* *Haarlem Memoirs* for 1786, or vol. xxii.

Every resemblance may be reduced to an equality in sensations or perceptions; but this supposes some equality in their causes: we say *some equality*, because the disposition of the organs, or of the soul, must necessarily affect the sensations or perceptions; but this can influence only their degree, and not their nature.

The character of one person resembles that of another only when they both speak and act so as to excite equal preceptions, or, to speak more strictly, the same perception: when they both display vivacity or indifference, anger or meekness, on the same occasions, and both excite in the soul of the observer identical perceptions, or rather the same perception of vivacity or indifference, of anger or meekness. These identical perceptions, the degree of which will depend much on the disposition of the observer's mind, must have identical causes, or, in other words, the same cause; which is the vivacity or indifference, the anger or meekness, displayed by each of these characters.

Every physical resemblance may therefore be reduced to one or more equalities; and every moral resemblance to one or more identities. Wherever there is moral resemblance there is analogy. Analogy may therefore be reduced to identity, and always supposes comparison.

Two objects are said to have an analogy to each other, or are called *analogous*, when some identity is discovered upon comparing them. An *analogical conclusion*, is a conclusion deduced from some identity.

The principles of analogy are a comparison of two objects; and one or more identities resulting from their being thus compared. The characters of analogy are—that two objects be compared—that there be one or more identities between these objects—and that this is discernible only by reason or intellect.

Physical resemblance is to the senses what *analogy* is to the understanding.—The former, when perfect, becomes equality; but the latter identity.

Resemblance and analogy are the foundations both of probability and of certainty. When we are not satisfied that the resemblance or the analogy is complete, we stop at probability; which becomes certainty when we are, or think we are, assured that the resemblance or the analogy is perfect.

In reasoning by analogy, we should be careful not to confound it with resemblance; and also not to deduce from the identity or identities, on which the analogy is founded, a conclusion, which has either no relation, or only a partial relation, to these identities.

The principal use of analogy in the investigation of physical and moral truth, according to our author, may be reduced to the four following: 1. By means of our senses to improve, first, our own judgment, and afterwards that of others, with respect to intellectual subjects. 2. To deduce a general from a particular truth. Having discovered and proved the truth of a proposition with respect to any particular object, examine whether this truth flows from a quality peculiar to this single object, or common to several objects. In the latter case all these objects may be comprehended under one general idea, founded on their common quality. Substitute this general idea instead of the particular object, and the proposition will become general, without ceasing to be true; because whatever evidently and solely results from the identity, on which analogy is founded, must necessarily be true with respect to all those objects in which the analogy is the same. 3. To prove the truth or falsehood of propositions which cannot be otherwise demonstrated. 4. To discover new truths in both natural and moral philosophy.

Analogy, among grammarians, is the correspondence which a word or phrase bears to the genius and received forms of any language.

ANALYSIS, in a general sense, implies the resolution of something compounded, into its original and constituent parts. The word is Greek, and derived from ἀναλυω, to resolve.

Analysis, in mathematics, is properly the method of resolving problems by means of algebraical equations; hence we often find that these two words, *analysis* and *algebra*, are used as synonymous.

Analysis, under its present improvements, must be allowed the Apex or height of all human learning: it is this method which furnishes us with the most perfect examples of the art of reasoning; gives the mind an uncommon readiness at deducing and discovering, from a few data, things unknown; and, by using signs for ideas, presents things to the imagination, which otherwise seemed out of its sphere: by this, geometrical demonstrations may be greatly abridged, and a long series of argumentations, wherein the mind cannot without the utmost effort and attention discover the connection of ideas, are hereby converted into sensible signs, and the several operations required therein effected by the combination of those signs. But, what is more extraordinary, by means of this art, a number of truths are frequently expressed by a single line, which, in the common way of explaining and demonstrating things, would fill whole volumes. Thus, by mere contemplation of one single line, whole sciences may be sometimes learnt in a few minutes time, which otherwise could scarce be attained in many years.

Analysis is divided, with regard to its object, into that of *finites* and *infinites*.

Analysis of Finite Quantities, is what we otherwise call specious arithmetic or algebra. See Algebra.

Analysis of Infinites, called also the *New Analysis*, is particularly used for the method of fluxions, or the differential calculus. See Fluxions.

Analysis, in logic, signifies the method of tracing things backward to their source, and of resolving knowledge into its original principles. This is also called the method of *resolution*; and stands opposed to the synthetic method, or that of *composition*.—The art of logical analysis consists principally in combining our perceptions, classing them together with address, and contriving proper expressions for conveying our thoughts, and representing their several divisions, classes, and relations.

Analysis, in rhetoric, is that which examines the connections, tropes, figures, and the like, inquiring into the proposition, division, passions, arguments, and other apparatus of rhetoric.

Several authors, as Freigius and others, have given analyses of Cicero's Orations, wherein they reduce them to their grammatical and logical principles; strip them of all the ornaments and additions of rhetoric which otherwise disguise their true form, and conceal the connection between one part and another. The design of these authors is to have those admired harangues just such as the judgment disposed them, without the help of imagination; so that here we may coolly view the force of each proof, and admire the use Cicero made of rhetorical figures to conceal the weak part of a cause.

A collection has been made of the analyses formed by the most celebrated authors of the 16th century, in 3 vols. folio.

Analysis is also used, in chemistry, for the decompounding

compounding of a mixed body, or the ſeparation of the principles and conſtituent parts of a compounded ſubſtance.

To analyze bodies, or reſolve them into their component parts, is indeed the chief object of the art of chemiſtry. Chemiſtry furniſhes ſeveral means for the decompoſition of bodies, which are all founded on the differences of the properties belonging to the different principles of which the body to be analyzed is compoſed. If, for example, a body be compoſed of ſeveral principles, ſome of which have a great, and others a moderate degree of volatility, and, laſtly, others are fixed, its moſt volatile parts may be at firſt ſeparated by a gradual heat in diſtilling veſſels; and then the parts which are next in volatility will paſs over in diſtillation; and laſtly, thoſe parts which are fixed, and capable of reſiſting the action of fire, will remain at the bottom of the veſſel.

Analysis is alſo uſed for a kind of ſyllabus, or table of the principal heads or articles of a continued diſcourſe, diſpoſed in their natural order and dependency. Analyſes are more ſcientifical than alphabetical indexes; but they are leſs uſed, as being more intricate.

Analysis is likewiſe uſed for a brief, but methodical, illuſtration of the principles of a ſcience; in in which ſenſe it is nearly ſynonymous with what we otherwiſe call a *ſynopſis*.

ANALYTIC, or Analytical, ſomething that belongs to, or partakes of, the nature of analyſis.—Thus we ſay, an analytical demonſtration, analytical proceſs, analytical table or ſcheme, analytical method of inveſtigation, &c.

The analytic method ſtands oppoſed to the ſynthetic. In natural philoſophy, as in mathematics, the inveſtigation of difficult things by the analytic method ought to precede the method of compoſition. This analyſis conſiſts in making experiments and obſervations, and in drawing general concluſions therefrom by induction; and admitting of no objections againſt the concluſions, but ſuch as are drawn from experiments, and other certain truths: and though the reaſoning from experiments and obſervations by induction be no demonſtration of general concluſions, yet it is the beſt method of reaſoning which the nature of things admits of; and may be eſteemed ſo much the ſtronger, as the induction is more general; and, if no exception occur from phenomena, the concluſion may be pronounced general. By this way of analyſis, we may proceed from compounds to their ingredients; from motions to the forces producing them; and, in general, from effects to their cauſes, and from particular cauſes to more general ones, until we arrive at thoſe which are the moſt general. This is the analytic method, according to the illuſtrious Newton.

The ſynthetic method conſiſts in aſſuming the cauſes diſcovered and received as principles: and by them explaining the phenomena proceeding from them, and proving the explanations. See Synthesis.

ANALYTICS, *Analytica*, the ſcience and uſe of analyſis. The great advantage of the modern mathematics above the ancient is in point of analytics.

Pappus, in the preface to his ſeventh book of Mathematical Collections, enumerates the authors on the ancient analytics; being Euclid, in his *Data* and *Poriſmatæ*; Apollonius, *de Sectione Rationis*, and in his *Conics*; Ariſtæus, *de Locis Solidis*: and Eratoſthenes, *de Mediis Proportionalibus*. But the ancient analytics were very different from the modern.

To the modern analytics principally belong algebra; an hiſtorical account of which, with the ſeveral authors thereon, ſee under the article Algebra.

ANAMABOA, a populous town in the kingdom of Fantin, in Guinea. The natives are generally great cheats, and muſt be carefully looked after in dealing with them, and their gold well examined, for it is commonly adulterated. It lies under the cannon of an Engliſh caſtle. The landing is pretty difficult on account of the rocks; and therefore thoſe that come here to trade are forced to go aſhore in canoes. The earth here is very proper to make bricks; the oyſters, when burnt, afford good lime; and there is timber in great abundance; ſo that here are all the materials for building. The country at Anamaboa is full of hills, beginning at a good diſtance from the town, and affording a very pleaſant proſpect. Indian corn and palm-wine are in great plenty. They have a green fruit called *papas*, as big as a ſmall melon, and which has a taſte like cauliflower. Anamaboa is much frequented by the Engliſh ſhips and others for corn and ſlaves, which laſt are ſometimes to be had in great numbers. The Engliſh fort is built on the foundation of a large old houſe, which ſubſiſted entire in 1679. It is a large edifice, flanked by two towers, and fortified towards the ſea with two baſtions; the whole of brick and ſtone cemented with lime. It ſtands upon a rock, at the diſtance of 30 paces from the ſea. It is mounted with 12 pieces of cannon and 12 patereroes; and defended by a garriſon of 12 whites and 18 blacks, under the command of the chief factor.

The natives treat the garriſon of this fort with great inſolence, inſomuch as often to block them up, and frequently, if they diſlike the governor, ſend him off in a canoe to Cape Coaſt with marks of the utmoſt contempt. Far from being able to oppoſe them, the Engliſh are glad to obtain their favour with preſents. In 1701, they declared war againſt the Engliſh; and having aſſembled in a tumultuous manner before the fort, they ſet fire to the exterior buildings, and went on with their outrages, till they were diſperſed by a diſcharge of the cannon from the batteries. The night following the Engliſh took their revenge, by ſetting fire to the town of Anamaboa; and thus hoſtilities continued for 20 days, till at laſt the natives were obliged to ſue for peace. This fort was abandoned in 1733; but has been reſumed by the Engliſh, who have continued in it ever ſince.

ANAMELECH, an idol of the Sepharvaites, who are ſaid in Scripture to have burned their children in honour of Adrammelech and Anamelech.—Theſe idols probably ſignified the ſun and moon. Some of the rabbins repreſent Anamelech under the figure of a mule, others under that of a quail or pheaſant.

ANAMIM, the ſecond ſon of Mizraim (Gen. x. 13.) Anamim, if we may credit the paraphraſt Jonathan the ſon of Uzziel, peopled the Mareotis; or the Pentapolis of Cyrene, according to the paraphraſt of Jeruſalem. Bochart is of opinion that theſe Anamims were the people that dwelt in the parts adjacent to the temple of Jupiter Ammon, and in the Naſamonitis.

Calmet

Calmet thinks the Amanians and Garmantes to be deſcended from Anamim.

ANAMORPHOSIS, in perſpective drawings, is a deformed or diſtorted portrait or figure, generally confuſed and unintelligible to the common unaſſiſted view; but when ſeen at a certain diſtance and height, or as reflected from a plain or curved mirror, will appear regular and in right proportion. See OPTICS (the *Index*), and PERSPECTIVE.

ANANAS, in botany, the trivial name of a ſpecies of bromelia. See BROMELIA.

ANANCITIS, in antiquity, a kind of figured ſtone, otherwiſe called *ſynochitis*, celebrated for its magical virtue of raiſing the ſhadows of the infernal gods.

ANANIAS, a Sadducee, high-prieſt of the Jews, who put to death St James the brother of our Lord, and was depoſed by Agrippa.

ANANISABTA, or ANANISAPTA, a magical word frequently found inſcribed on coins and other amulets, ſuppoſed to have a virtue of preſerving the wearer from the plague.

ANAPÆST, in ancient poetry, a foot conſiſting of two ſhort ſyllables and one long: Such is the word ſcŏpŭlōs. It is juſt the reverſe of the dactyl.

ANAPÆSTIC VERSES, thoſe conſiſting wholly or chiefly of anapeſts.

ANAPHE (anc. geog.), an iſland ſpontaneouſly emerging out of the Cretan ſea, near Thera (Pliny, Strabo); now called *Nanſio*. Its name is from the ſudden appearance of the new moon to the Argonauts in a ſtorm (Apollonius), *Anaphæus*, an epithet of Apollo, who was worſhipped there. *Anaphæi*, the people.

ANAPHORA, in rhetoric, the repetition of the ſame word or words in the beginning of a ſentence or verſe: Thus Virgil,

> *Pan etiam Arcadia mecum ſi judice certet,*
> *Pan etiam Arcadia dicat ſe judice victum.*

ANAPHORA, among phyſicians, the throwing off purulent matter by the mouth.

ANAPHRODISIA, ſignifies impotence, or want of power to procreate. See IMPOTENCE.

ANAPLASIS, ſignifies the replacing or ſetting a fractured bone.

ANAPLORETICS, medicines that promote the growth or granulation of the fleſh in wounds, ulcers, &c.

ANARCHI, Αναρχοι, in antiquity, a name given by the Athenians to four ſupernumerary days in their year, during which they had no magiſtrates. The Attic year was divided into ten parts, according to the number of tribes, to whom the precedency of the ſenate fell by turns. Each diviſion conſiſted of 35 days; what remained after the expiration of theſe, to make the lunar year complete, which according to their computation conſiſted of 354 days, were employed in the creation of magiſtrates, and called αναρχοιη μεραι and αρχαιρεσιοι.

ANARCHY, the want of government in a nation, where no ſupreme authority is lodged, either in the prince or other rulers; but the people live at large, and all things are in confuſion. The word is derived from the Greek privative α, and αρχη, *command principality*. Anarchy is ſuppoſed to have reigned after the deluge, before the foundation of monarchies. We ſtill find it obtain in ſeveral parts, particularly of Africa and America.

ANARCHY is alſo applied to certain troubleſome and diſorderly periods, even in governments otherwiſe regular. In England, the period between the death of Cromwell and King Charles's reſtoration is commonly repreſented as an *anarchy*. Every month produced a new ſcheme or form of government. Enthuſiaſts talked of nothing but annulling the laws, aboliſhing all writings, records, and regiſters, and bringing all men to the primitive level. No modern nation is more ſubject to anarchies than Poland; where every interval between the death of one king and the election of another is a perfect picture of confuſion, inſomuch that it is a proverb among that people, *Poland is governed by confuſion*. The Jewiſh hiſtory preſents numerous inſtances of anarchies in that ſtate, uſually denoted by this phraſe, that *in thoſe days there was no king in Iſrael, but every man did that which was right in his own eyes*; which a juſt picture of an *anarchy*.

ANARRHICAS, in ichthyology, a genus of fiſhes of the order of apodes. There is but one ſpecies of this genus, viz. the anarrhicas lupus, or ſea-wolf; which ſeems to be confined to the northern parts of the globe. We find it in the ſeas of Greenland; in thoſe of Iceland and Norway; on the coaſts of Scotland and of Yorkſhire; and laſtly, in that part of the German ocean which waſhes the ſhores of Holland, the moſt ſouthern of its haunts that we can with any certainty mention.

It is a moſt ravenous and fierce fiſh, and, when taken, faſtens on any thing within its reach; the fiſhermen, dreading its bite, endeavour as ſoon as poſſible to beat out its fore-teeth, and then kill it by ſtriking it behind the head. Schonevelde relates, that its bite is ſo hard, that it will ſieze on an anchor, and leave the marks of its teeth in it; and the Daniſh and German names of *ſteenbider* and *ſteinbeiſſer*, expreſs the ſenſe of its great ſtrength, as if it was capable of cruſhing even ſtones with it jaws.

It feeds almoſt entirely on cruſtaceous animals and ſhell-fiſh, ſuch as crabs, lobſters, prawns, muſcles, ſcollops, large whelks, &c. theſe it grinds to pieces with its teeth, and ſwallows with the leſſer ſhells. It does not appear they are diſſolved in the ſtomach, but are voided with the fæces; for which purpoſe the aperture of the anus is wider than in other fiſh of the ſame ſize.

It is full of roe in February, March, and April, and ſpawns in May and June.

This fiſh has ſo diſagreeable and horrid an appearance that nobody at Scarborough, except the fiſhermen, will eat it, and they prefer it to holibut. They always, before dreſſing, take of the head and ſkin.

The ſea-wolf grows to a large ſize: thoſe on the Yorkſhire coaſt are ſometimes found of the length of four feet; according to Dr Gronovius, they have been taken near Shetland ſeven feet long, and even more.

The head is a little flatted on the top; the noſe blunt; the noſtrils are very ſmall; the eyes ſmall, and placed near the end of the noſe.

The teeth are very remarkable, and finely adapted to its way of life. The fore-teeth are ſtrong, conical, diverging a little from each other, ſtand far out of the jaws,

jaws, and are commonly six above and the same below, though sometimes they are only five in each jaw: these are supported within-side by a row of lesser teeth, which makes the number in the upper jaw 17 or 18, in the lower 11 or 12. The sides of the under jaw are convex inwards, which greatly adds to their strength, and at the same time allows room for the large muscles with which the head of this fish is furnished. The *dentes molares*, or grinding-teeth of the under jaw, are higher on the outer than the inner edges, which inclines their surfaces inward: they join to the canine teeth in that jaw, but in the upper are separate from them. In the centre are two rows of flat strong teeth fixed on an oblong basis upon the bones of the palate and nose.

The teeth of the anarrhicas are often found fossil; and in that state called *bufonites*, or *toad-stones*: these were formerly much esteemed for their imaginary virtues, and were set in gold, and worn as rings.

The two bones that form the under jaw are united before by a loose cartilage; which mechanism admitting of a motion from side to side, most evidently contributes to the design of the whole, viz. a facility of breaking, grinding, and comminuting, its testaceous and crustaceous, food. At the entrance of the gullet, above and below, are two echinated bones: these are very small, being the less necessary, as the food is in a great measure comminuted in the mouth by aid of the grinders.

The body is long, and a little compressed sidewise; the skin smooth and slippery: it wants the lateral line. The pectoral fins consist of 18 rays. The dorsal fin extends from the hind-part of the head almost to the tail; the rays in the fresh fish are not visible. The anal fin extends as far as the dorsal fin. The tail is round at its end, and consists of 13 rays. The sides, back, and fins, are of a livid lead colour; the two first marked downwards with irregular obscure dusky lines: these in different fish have different appearances. The young are of a greenish cast, resembling the sea-wreck, amongst which they reside for some time after their birth.

ANARROPIA, among physicians, a tendency of the humours to the head or superior parts.

ANAS (anc. geog.), a river of Spain, rising in the territory of Laminium, of the Hither Spain, and now spreading into lakes, again restraining its waters, or, burrowing itself entirely in the earth, is pleased often to reappear; it pours into the Atlantic (Pliny); now *Guadiana*, rising in the south-east of New-Castile, in a district commonly called Campo de Montiel, not far from the mountain Consuegra, from the lakes called *las Lagunas de Guadiana*, and then it is called *Rio Roydera*; and, after a course of six leagues, burying itself in the earth for a league, it then rises up again from three lakes, called *los Ojos de Guadiana*, near the village Villa Harta, five leagues to the north of Calatrava, and directs its course westward through New Castile, by Medelin, Merida, and Badajox, where it begins to bend its course southwards, between Portugal and Andalusia, falling into the bay of Cadiz near Ayamonte.

ANAS, in orinthology, a genus of birds belonging to the order of anseres. The beak of this genus is a little obtuse, covered with an epidermis or skin, gibbous at the base and broad at the apex: the tongue is obtuse and fleshy; the feet are webbed and fitted for swimming. The species are,

1. The cygnus, *ferus & mansuetus*.

α. The *ferus*, with a semicylindrical black bill, yellow wax, and a white body, is the whistling or wild swan of English authors, and is less than the tame or mute species, being about five feet in length. These birds inhabit the northern world as high as Iceland, and as low as the soft climate of Greece or of Lydia, the modern Anatolia, in Asia Minor: it even descends as low as Egypt. They swarm, during summer, in the great lakes and marshes of the Tartarian and Siberian desarts; and resort in great numbers to winter about the Caspian and Euxine seas. Those of the eastern parts of Siberia retire beyond Kamtschatka, either to the coasts of America, or to the isles north of Japan. In Siberia they spread far north, but not to the Arctic circle. They arrive in Hudson's Bay about the end of May, where they breed in great numbers on the shores, in the islands, and in the inland lakes; but all retire to the southern parts of North-America in autumn, even as low as Carolina and Louisiana. In Carolina they are said to be of two sorts; the larger, called from its note the *Trumpeter*, arrive in great flocks to the fresh rivers in winter, and in February retire to the great lakes to breed: the lesser are called *Hoopers*, and frequent mostly the salt water. The Indians of Louisiana wear the skins, with the down attached to them, sewed together by way of covering; and of the larger feathers they make diadems for their chiefs, as well as weave the smaller on threads, as barbers do for their wigs, with which they cover garments, which are worn only by women of the highest rank. In August these birds lose their feathers, and are not able to fly; when the natives of Iceland and Kamtschatka hunt them with dogs, which catch them by the neck, and easily secure their prey. In the last place they are also killed with clubs. The eggs are accounted good food; and the flesh, especially that of the young, is much esteemed by the inhabitants. The uses of the feathers are manifest to every one; and the skins of the body are worn by the inhabitants; besides which, that of the legs, taken off whole, is used for purses, and appears not unlike shagreen. Wild swans, Linnæus says, frequently visit Sweden after a thaw, and are caught with apples in which a hook is concealed. The wild swan frequents the coasts of Great Britain, in hard winters, in large flocks, but does not breed there. Martin * acquaints us, that swans come in October in great number to Lingey, one of the Western isles; and continue there till March, when they return northward to breed. A few continue in Mainland, one of the Orkneys, and breed in the little isles of the fresh-water lochs: but the multitude retires at the approach of spring. On that account, swans are there the countryman's almanack: on their quitting the isle, they presage good weather; on their arrival, they announce bad. These, as well as most other water-fowl, prefer, for the purpose of incubation, those places that are least frequented by mankind: accordingly we find that the lakes and forests of the distant Lapland are filled during summer with myriads of water-fowl;

* *Descript. West. Isles*, 71.

fowl; and there ſwans, geeſe, the duck-tribe, gooſanders, divers, &c. paſs that ſeaſon; but in autumn return to other, more hoſpitable, ſhores.

This ſpecies has ſeveral diſtinctions from the ſpecies which in Britain is called the *tame ſwan*. In Ruſſia this ſpecies more fitly claims the name, it being the kind moſt commonly tamed in that empire. The whiſtling ſwan carries its neck quite erect, the other ſwims with it arched. This is far inferior in ſize. This has twelve ribs on a ſide, the mute only eleven. But the moſt remarkable is the ſtrange figure of the windpipe; which falls into the cheſt, then turns back like a trumpet, and afterwards makes a ſecond bend to join the lungs. Thus it is enabled to utter a loud and ſhrill note. The other ſwan, on the contrary, is the moſt ſilent of birds: it can do nothing more than hiſs, which it does on receiving any provocation. The vocal kind emits its loud notes only when flying or calling. Its ſound is, *whooh, whooh*, very loud and ſhrill, but not diſagreeable, when heard far above one's head and modulated by the winds. The natives of Iceland compare it to the notes of a violin. In fact, they hear it (ſays Mr Pennant) at the end of their long and gloomy winter; when the return of the ſwans announces the return of ſummer; every note muſt be therefore melodious which preſages the ſpeedy thaw, and the releaſe from their tedious confinement.

It is from this ſpecies alone that the ancients have given the fable of the ſwan being endued with the powers of melody. Embracing the Pythagorean doctrine, they made the body of this bird the manſion of the ſouls of departed poets; and after that, attributed to the birds the ſame faculty of harmony which their inmates poſſeſſed in a pre-exiſtent ſtate. The vulgar, not diſtinguiſhing between ſweetneſs of numbers and melody of voice, thought that real which was only intended figuratively. The mute ſwan, Mr Pennant obſerves, never frequents the Padus, nor is ever ſeen on the Cayſter in Lydia; each of them ſtreams celebrated by the poets for the great reſort of ſwans.

In time, a ſwan became a common trope for a *bard*. Horace calls Pindar *Dircæum Cygnum*; and in one ode even ſuppoſes himſelf changed into a ſwan. Virgil ſpeaks of his poetical brethren in the ſame manner:

Vare, tuum nomen
Cantantes ſublime ferent ad ſidera cygni. *Eclog*. ix.

When he ſpeaks of them figuratively, he aſcribes to them melody, or the power of muſic; but when he talks of them as birds, he lays aſide fiction, and, like a true naturaliſt, gives them their real note:

Dant ſonitum *rauci* per ſtagna loquacia cygni.
Æn. Lib. xi. 458.

It was alſo a popular opinion among the ancients, that the ſwan foretold its own end. To explain this, we muſt conſider the twofold character of the poet, *vates* and *poeta*, which the fable of the tranſmigration continues to the bird, or they might be ſuppoſed to derive that faculty from Apollo their patron deity, the god of prophecy and divination.

As to their being ſuppoſed to ſing more ſweetly at the approach of death, the cauſe is beautifully explained by Plato, who attributes that unuſual melody to the ſame ſort of ecſtaſy that good men are ſometimes ſaid to enjoy at that awful hour, foreſeeing the joys that are preparing for them on putting off mortality.

β, The *manſuetus*, or mute ſwan, is the largeſt of the Britiſh birds. It is diſtinguiſhed externally from the wild ſwan; firſt, by its ſize, being much larger; ſecondly, by its bill, which in this is red, and the tip and ſides black, and the ſkin between the eyes and bill is of the ſame colour. Over the baſe of the upper mandible, projects a black callous knob; the whole plumage, in old birds, is white; in young ones, aſh-coloured till the ſecond year: the legs are duſky; but Dr Plott mentions a variety found on the Trent near Rugely, with red legs.

The ſwan is found wild in Ruſſia and Siberia, moſt plentiful in the laſt. It arrives later from the ſouth, and does not ſpread ſo far north. Thoſe about the ſouthern part of the Caſpian Sea are very large, and much eſteemed for the uſe of the table. The ſwan is held in high veneration by the Mahometans. It is a very ſtrong bird, and ſometimes exceeding fierce: has not unfrequently been known to throw down and trample under feet youths of fifteen or ſixteen years of age, and an old one to break the leg of a man with a ſtroke of the wings. It is ſaid to be very long-lived, and frequently to arrive at the hundredth year. The young are not perfect in plumage till the ſecond year. The ſwan lays the firſt egg in February, and continues laying every other day to the amount of ſix, ſeven, or eight eggs; theſe it places on a bed of graſs near the water, and ſits ſix weeks. It feeds on both fiſh and herbage.

No bird, perhaps, makes ſo inelegant a figure out of the water, or has the command of ſuch beautiful attitudes on that element, as the ſwan: almoſt every poet has taken notice of it; but none with that juſtneſs of deſcription, and in ſo pictureſque a manner, as Milton:

The ſwan, with arched neck
Between her white wings mantling, proudly rows
Her ſtate with oary feet. *Par. Loſt*, B. vii.

In former times, it was ſerved up at every great feaſt, when the elegance of the table was meaſured by the ſize and quantity of the good cheer. Cygnets are to this day fattened at Norwich about Chriſtmas, and are ſold for a guinea a-piece.

Swans were formerly held in ſuch great eſteem in England, that by an act of Edward IV. c. 6. "no one that poſſeſſed a freehold of leſs clear yearly value than five marks, was permitted to keep any, *other than the ſon of our ſovereign lord the king*." And by the eleventh of Henry VII. c. 17. the puniſhment for taking their eggs was impriſonment for a year and a day, and a fine at the king's will. Though at preſent they are not ſo highly valued as a delicacy, yet great numbers are preſerved for their beauty; multitudes are to be ſeen on the Thames and Trent, but no where greater numbers than the ſalt-water inlet of the ſea near Abbotſbury in Dorſetſhire.

2. The cygnoides, with a ſemicylindrical bill, gibbous wax, and tumid eye-brows. It is the ſwan-gooſe of Ray, from Guinea. There is likewiſe a variety of this ſpecies, of a leſs ſize, called the *gooſe of Muſcovy*. They are found wild about the Lake Baikal in the eaſt of Siberia, and in Kamtſchatka. They are alſo kept tame in moſt parts of the Ruſſian empire. Theſe birds likewiſe inhabit China, and are common at the Cape of Good Hope. This is no doubt the ſpecies mentioned

mentioned by Kolben, called *crop-gooſe*; who ſays, that the ſailors make tobacco-pouches and purſes of the membrane which hangs beneath the throat, as it is ſufficiently tough for ſuch purpoſes, and will hold two pounds of tobacco.

They are ſufficiently common in Britain, and readily mix with the common gooſe; the breeds uniting as freely, and continuing to produce as certainly, as if no ſuch mixture had taken place. They are much more noiſy than the common tame geeſe, taking alarm at the leaſt noiſe; and even without diſturbance will emit their harſh and diſagreeable ſcream the whole day through. They walk very erect, with the neck much elevated; and as they bear a middle line between that of the ſwan and gooſe, they have not improperly been called *ſwan-geeſe*.

3. The tadorna, or ſhelldrake, has a flat bill, a compreſſed forehead, a greeniſh black head, and the body is variegated with white. This ſpecies is found as far as Iceland to the north. It viſits Sweden and the Orkneys in the winter, and returns in ſpring. It is found in Aſia about the Caſpian Sea, and all the ſalt lakes of the Tartarian and Siberian deſarts, as well as in Kamtſchatka. Late voyagers, if right in the ſpecies, have alſo met with it at Falkland Iſles and Van Diemen's Land. It breeds in deſerted rabbit holes, or occupies them in the abſence of the owners, who, rather than make an attempt at diſlodging the intruders, form others; though, in defect of ready-made quarters, theſe birds will frequently dig holes for themſelves. They lay fifteen or ſixteen roundiſh white eggs. Theſe are placed at the farther end of the hole, covered with down ſupplied from the breaſt of the female, who ſits about 30 days. She is very careful of her young, and will often carry them from place to place in her bill: "This we are certain of (ſays Mr Latham), from a young one having been dropt at the foot of an intelligent friend unhurt, by the mother flying over his head." When a perſon attempts to take their young, the old birds ſhow great addreſs in diverting his attention from the brood: they will fly along the ground as if wounded, till the former are got into a place of ſecurity, and then return and collect them together. From this inſtinctive cunning, Turner, with good reaſon, imagines them to be the *chenalopex* or *fox-gooſe*, of the ancients. The natives of the Orkneys to this day call them the *ſly-gooſe*, from an attribute of that quadruped.

The young, as ſoon as hatched, take to the water, and ſwim ſurpriſingly well; but do not come to their full plumage till the ſecond year. This ſpecies, Mr Latham informs us, may be hatched under a tame duck, and the young readily brought up; but are apt, after a few years, to attempt the maſtery over the reſt of the poultry. In a ſtate of nature their food ſeems chiefly to be ſmall fiſh, marine inſects, and ſhells; herbage has likewiſe been found in their ſtomachs. In a tame ſtate will eat bread, grain, and greens. Their great beauty would tempt us to endeavour at domeſticating the race; but it will not thrive completely, except in the neighbourhood of ſalt water, which ſomehow ſeems eſſential to its well-being. The fleſh likewiſe is rank and unſavoury, though the eggs have at all times been thought very good.

4. The ſpectabilis, has a compreſſed bill, gibbous at the baſe, a black feathery carina, and a hoary head. It is the grey-headed duck of Edwards, and the king-duck of Pennant. This beautiful ſpecies is found at Hudſon's Bay, at Churchill River, and (though ſcarce) at York Fort; in winter it is met with as far ſouth as New-York. It is pretty frequent in the north of Siberia and Kamtſchatka; it is found alſo on the coaſt of Norway, and has been killed in the Orkneys. It is common in Greenland; where the fleſh is accounted excellent, and the crude gibbous part of the bill a great delicacy. It produces a down equally valuable as the eider. The ſkins are ſewed together, and make warm garments. The natives kill them with darts, and uſe the following method to ſucceed;—A number of men in canoes falling in with a flock while ſwiming, on a ſudden ſet up a ſhouting, making as much noiſe as they can; on which, the birds being too much frightened to fly away, dive under the water; but as the place at which they are to riſe again is known by the bubbling of the water above, the hunters follow them up as cloſe as may be; and after acting this three or four times over, the birds become ſo fatigued as to be eaſily killed.—This ſpecies builds on the ſides of ponds and rivers, making its neſt of ſticks and moſs, and lining it with feathers from the breaſt. It lays four or five whitiſh eggs, as large as thoſe of the gooſe. The young fly in July. The food conſiſts chiefly of worms and graſs.

5. The fuſca, or velvet duck; is of a blackiſh colour, has a white ſpot behind the eyes, and a white line on the wings. The male of this ſpecies is diſtinguiſhed by a gibboſity at the baſe of the bill. It is the black duck of Ray, and is in length about 20 inches. This ſpecies frequents Hudſon's Bay in ſummer, where it breeds. The neſt is compoſed of graſs; in which it lays from four to ſix white eggs, and hatches in July. It feeds on graſs, and is known by the names of *cus cuſi qua tum*. It retires ſouth in winter: when it is frequently ſeen as far ſouth as New-York. Late navigators met with it at Aoonalaſhka. It is now and then ſeen on the coaſts of England, but is not common. It is more frequent on the continent, inhabiting Denmark and Ruſſia. In ſome parts of Siberia it is very common; and it enters the liſt of thoſe found at Kamtſchatka. In breeding-time, it goes far inland to lay the eggs; which are eight or ten in number, and white. After the ſeaſon is over, the males are ſaid to depart; the females ſtaying behind till the young are able to fly, when the two laſt go likewiſe off, but to what part is not certain. It is in great plenty at Ochotſka, eſpecially about the equinox. Fifty or more of the natives go in boats and ſurround the whole flock, driving them into the flood of the river Ochotſka; and, as ſoon as it ebbs, the whole company fall on them at once with clubs, and often knock ſo many of them on the head that each man has 20 or 30 for his ſhare.

6. The nigra, or ſcoter, is totally black, and has a gibboſity at the baſe of the bill; the tail reſembles a wedge; the female is browniſh. It is the leſſer black diver of Ray, and meaſures in length 22 inches. Theſe birds are found on the northern coaſts of England and thoſe of Scotland in the winter ſeaſon; but no where ſo common as on the French coaſts, where they are ſeen in prodigious numbers from November to March,

Anas. especially if the wind be to the north or north-west. Their chief food is a glassy bivalve shell, near an inch long, called by the French *vaimeaux*. These they are perpetually diving after, frequently to the depth of some fathoms; and an usual method of catching them is by placing nets under the water in such places as the shells are most numerous; by which means 30 or 40 dozen of them have been taken in one tide. The day seems to be spent by these birds between diving and flying to small distances over the water, which it does so low as frequently to dip the legs therein. It swallows the food whole, and soon digests the shells, which are found quite crumbled to powder among the excrements. It has been kept tame for some time, and will feed on soaked bread. The flesh tastes fishy to an extreme; on which account is allowed by the Roman-Catholics to be eaten on fast days and in lent; and indeed must be a sufficient mortification.—These birds abound in all the northern parts of the continent, Lapland, Sweden, Norway, and Russia; and are found in great plenty on the great lakes and rivers of the north and east of Siberia, as well as on the sea shores. It likewise inhabits North-America; being met with at New-York; and in all probability much more to the north on this continent and that of Asia, Osbeck having met with them in 30 and 34 degrees south latitude, between the island of Java and St Paul, in the month of June.

7. The anser, *feres et mansuetus*; or gray lag, and tame goose. The *grey lag* or *wild goose*, is two feet nine inches in length, and five feet in extent. The bill is large and elevated; of a flesh colour, tinged with yellow; the head and neck cinereous; breast and belly whitish, clouded with grey or ash colour; back, grey; the legs of a flesh colour. This species resides in the fens the whole year; breeds there, and hatches about eight or nine young, which are often taken, easily tamed, and esteemed most excellent meat, superior to the domestic goose. Towards winter they collect in great flocks, but in all seasons live and feed in the fens. On the continent they are migratory, changing place in large flocks, often 500 or more: in this case, the flock is triangular in shape, with one point foremost; and as the goose which is first is tired soonest, it has been seen to drop behind, and another to take his place. In very small flocks, however, they are sometimes seen to follow one another in a direct line. Geese seem to be general inhabitants of the globe.

The *mansuetus*, is the grey lag in a state of domestication, and from which it varies in colour, though much less so than either the mallard or cock, being ever more or less verging to grey; though in all cases the whiteness of the vent, and upper tail coverts, is manifest. It is frequently found quite white, especially the males; and doubts have arisen, which of the two colours should have the preference in point of eating.—Tame geese are kept in great multitudes in the fens of Lincolnshire, in England; a single person will have 1000 old geese, each of which will rear seven; so that towards the end of the season he will become possessed of 8000. During the breeding-season these birds are lodged in the same houses with the inhabitants, and even in their very bed-chambers: in every apartment are three rows of coarse wicker pens, placed one above another; each bird has its seperate lodge divided from the other, which it keeps possession of during the time of sitting. A person called a *gozzard*, i. e. *goose-herd*, attends the flock, and twice a-day drives the whole to water; then brings them back to their habitations, helping those that live in the upper stories to their nests, without ever misplacing a single bird. The geese are plucked five times in the year: the first plucking is at Lady-day, for feathers and quills; the same is renewed, for feathers only, four times more between that and Michaelmas. The old geese submit quietly to the operation, but the young ones are very noisy and unruly. If the season proves cold, numbers of them die by this barbarous custom. Vast numbers of geese are driven annually to London, to supply the markets; among them, all the superannuated geese and ganders, which, by a long course of plucking, prove uncommonly tough and dry.

The goose in general breeds only once in a year; but will frequently have two hatches in a season, if well kept. The time of sitting is about 30 days. They will also produce eggs sufficient for three broods, if they are taken away in succession. It is said to be very long-lived, as we have authority for their arriving at no less than 100 years.

8. The *bean-goose* is two feet seven inches in length; in extent four feet eleven. The bill, which is the chief distinction between this and the former, is small, much compressed near the end, whitish, and somewhat pale red in the middle, and black at the base and nail: the head and neck are cinereous brown, tinged with ferruginous; breast and belly dirty white, clouded with cinereous; the back of a pale ash colour; feet and legs of a saffron colour: claws black. This species arrives in Lincolnshire in autumn; and is called the *bean-goose*, from the likeness of the nail of the bill to a horse-bean. They always light on corn-fields, and feed much on the green wheat. They never breed in the fens; but all disappear in May. They retreat to the sequestered wilds of the north of Europe; in their migration they fly a great height, cackling as they go. They preserve a great regularity in their motions; sometimes forming a straight line; at others, assuming the shape of a wedge, which facilitates their progress, for they cut the air readier in that form than if they flew pell-mell.

9. The erythropus, or laughing goose of Edwards, is a native of Europe and America. The length of this species is about two feet four, the extent four feet six; the bill is elevated, of a pale yellow colour, with a white ring at the base; the forehead is white; the breast and belly are of a dirty white, marked with great spots of black; and the legs yellow. These visit the fens and other parts of England during winter, in small flocks; they keep always in marshy places, and never frequent the corn-lands. They disappear in the earliest spring, and none are seen after the middle of March. Linnæus makes this goose the female of the *bernacle*; but Mr Pennant thinks his opinion not well founded.

The *bernacle* (erythropus *mas* Lin.) is two feet one inch in length, the breadth four feet five inches: the bill is black; the forehead and cheeks are white; from the bill to the eyes, there is a black line; the hind part of the head, the whole neck, and upper part of the breast and back, are of a deep black; the tail is black, the legs are of the same colour, and small. These birds appear

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appear in vaſt flocks during winter, on the north-weſt coaſts of Great-Britain; they are very ſhy and wild; but on being taken, grow in a few days as familiar as the tame geeſe. In February they retire as far as Lapland, Greenland, and even Spitzbergen, to breed. They live to a great age: the Rev. Dr Buckworth of Spalding, had one which was kept in the family above 32 years, but was blind during the two laſt; what its age was when firſt taken, was unknown.

Theſe are the birds that about 200 years ago were believed to be generated out of wood, or rather a ſpecies of ſhell that is often found ſticking to the bottoms of ſhips, or fragments of them; and were called *tree-geeſe* *. Theſe were alſo thought by ſome writers to have been the *chenalopeces* of Pliny; they ſhould have ſaid *cheneroſes*, for thoſe were the birds which that naturaliſt ſaid were found in Britain: but as he has ſcarce left us any deſcription of them, it is difficult to ſay which ſpecies he intended. Mr Pennant imagines it to be the following; which is far inferior in ſize to the wild-gooſe, and very delicate food, in both reſpects ſuiting his deſcription of the *cheneros*.

* See *Lepas*.

10. The race-horſe or loggerhead gooſe, is in length 32 inches, and weighs from 20 to 30 pounds. The bill is three inches long, and of an orange colour: the irides are orange, ſurrounded with black, and then with orange: the head, neck, and upper parts of the body are of a deep aſh-colour; the outer edge of the ſecondaries white, forming a band of the ſame on the wing: the under parts of the body duſky down the middle; over the thighs cinereous blue; vent white; quills and tail black: the wings are very ſhort, not reaching to the rump: on the bend of the wing is a yellow knob, half an inch in length; the legs are browniſh orange, the webs duſky, and the claws black. Theſe inhabit Falkland Iſlands, Staaten Land, &c. and were moſtly ſeen in pairs, though ſometimes they were obſerved in large flocks. From the ſhortneſs of their wings they were unable to fly; but they made conſiderable uſe of them when in the water, on which they ſeemed as it were to run, at leaſt they ſwam, with the aſſiſtance of the wings uſed as oars, at an incredible rate, inſomuch that it was a moſt difficult thing to ſhoot them while on that element: to catch them, the ſailors uſed to ſurround a flock with boats, and drive them on ſhore; where, unable to raiſe themſelves from the ground, they ran very faſt, but ſoon growing tired, and ſquatting down to reſt, were readily overtaken, and knocked on the head. Their fleſh was ſometimes eaten by the ſailors, in defect of that of the buſtard gooſe; but it was not much reliſhed, being rank and fiſhy, and thought more fit for the hogs, which ate it greedily, and fatted well upon it, boiled.

11. The ſnow-gooſe is in length two feet eight inches, and weighs between five and ſix pounds. The bill is ſomewhat ſerrated at the edges: the upper mandible ſcarlet, the lower whitiſh: the general colour of the plumage is ſnow white, except the firſt ten quills, which are black, with white ſhafts: the legs are of a deep red. The young are of a blue colour, till they are a year old. Theſe are very numerous at Hudſon's-Bay, and called by the natives *Way-way* and *Wapa whe whe*. They viſit Severn River in May, and ſtay a fortnight; but go farther north to breed: they return to Severn-Fort the beginning of September, and ſtay to the middle of October, when they depart for the ſouth, and are obſerved to be attended with their young, in flocks innumerable. At this time many thouſands are killed by the inhabitants; who pluck them, and take out the entrails, and putting the bodies into holes dug in the ground cover them with earth, which freezing above them, keeps them perfectly ſweet throughout the ſevere ſeaſon; during which there is no more to do than occaſionally to open one of thoſe ſtorehouſes, when they find them ſweet and good. They ſeem to occupy alſo the weſtern ſide of America. In the ſummer months, they are plenty on the arctic coaſt of Siberia, but never migrate beyond longitude 130. They are ſuppoſed to paſs the winter in more moderate climes, as they have been ſeen flying at a great height over Sileſia; probably on their paſſage to ſome other country, as it does not appear that they continue there. In like manner, thoſe of America paſs the winter in Carolina. Here they arrive in vaſt flocks; and feed on the roots of ſage and graſs, which they tear up like hogs. It uſed to be a common practice in that country to burn a piece of a marſh, which enticed the geeſe to come there, as they could then more readily get at the roots, which gave the ſportſman opportunity of killing as many as he pleaſed. This ſpecies is the moſt numerous and the moſt ſtupid of all the gooſe race. They ſeem to want the inſtinct of others, by their arriving at the mouths of the Arctic Aſiatic rivers before the ſeaſon in which they can poſſibly ſubſiſt. They are annually guilty of the ſame miſtake, and annually compelled to make a new migration to the ſouth in queſt of food, where they paſs their time till the northern eſtuaries are freed from the bonds of ice. They have ſo little of the ſhyneſs of other geeſe, that they are taken in the moſt ridiculous manner imaginable about Jakut, and the other parts of Siberia, which they frequent. The inhabitants firſt place, near the banks of the rivers, a great net, in a ſtraight line, or elſe form a hovel of ſkins ſewed together. This done, one of the company dreſſes himſelf in the ſkins of a white rein-deer, advances towards the flock of geeſe, and then turns back towards the net or the hovel; and his companions go behind the flock, and by making a noiſe drive them forward. The ſimple birds miſtake the man in white for their leader, and follow him within reach of the net, which is ſuddenly pulled down and captivates the whole. When he chooſes to conduct them to the hovel, they follow in the ſame manner; he creeps in at a hole left for that purpoſe, and out at another on the oppoſite ſide, which he cloſes up. The geeſe follow him through the firſt; and as ſoon as they are got in, he paſſes round, and ſecures every one.

12. The great gooſe is of a very large ſize, weighing near 25 or 30 Ruſſian pounds. The bill is black; baſe of it tawny: body duſky; the under parts are white; the legs ſcarlet. It is found on the eaſt of Siberia, from the river Lena to Kamtſchatka; and is taken in great numbers.

13. The ruficolis, or red-breaſted gooſe, is in length 21 inches; weight three pounds troy. The bill is ſmall and brown; the tail black; the irides are yellow brown; round the eyes fringed with brown; fore part of the head and crown black, paſſing backwards in a narrow ſtripe quite to the back; on the breaſt is a narrow band of white feathers with black ends form-

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ing a band of white and another of black: the sides are striped with black: back and wings black, the last even with the tail: legs black. This most elegant of geese is found to breed from the mouth of the Ob, along the coasts of the Icy sea, to that of the Lena. Its winter quarters are not certainly known. Small flocks are observed in the spring flying from the Caspian sea along the Volga northward; and are seen about Zarizyn, between the sixth and tenth of April. They rest a little time on the banks of the Sarpa, but soon resume their arctic course. Their winter retreat is probably in Persia. They are highly esteemed for the table, being quite free from any fishy taste.

14. The casarca, or ruddy-goose, is larger than a mallard, and seems even larger than it really is, from the length of wing, and standing high on its legs. The bill is black: the irides are yellowish brown: forehead, cheeks, and throat, yellowish: fore part of the neck ferruginous, encircled with a collar of black, inclining to deep rufous on the throat: the breast and side are pale rufous; the belly is obscure: the back is pale; the lower part is undulated, hoary, and brown, not very distinct; the rump and tail are greenish black; the legs long and black. This species is found in all the southern parts of Russia and Siberia in plenty. In winter it migrates into India, and returns northward in spring. It makes the nest in the craggy banks of the Wolga and other rivers, or in the hollows of the deserted hillocks of marmots; making it after the manner of the shelldrake, and is said to form burrows for itself in the manner of that bird. It has been known also to lay in a hollow tree, lining the nest with its own feathers. It is monogamous: the male and female sit in turns. The eggs are like those of the common duck. When the young come forth, the mother will often carry them from the place of hatching to the water with her bill. They have been attempted to be domesticated, by rearing the young under tame ducks; but without success, as they ever are wild, effecting their escape the first opportunity: or, if the old ones are taken and confined, they lay the eggs in a dispersed manner, and never sit. The voice is not unlike the note of a clarinet, while flying; at other times they cry like a peacock, especially when kept tame; and now and then cluck like a hen. It is very choice of its mate; for if the male is killed, the female will not leave the gunner till she has been two or three times shot at. The flesh is thought very good food.

15. The bernicla is of a brown colour; with the head, neck, and breast, black; and a white collar. These birds, like the bernacles, frequent the British coasts in winter; and are particularly plenty, at times, on those of Holland and Ireland, where they are taken in nets placed across the rivers. In some dry seasons they have resorted to the coasts of Picardy, in France, in such prodigious flocks, as to prove a pest to the inhabitants, especially in the winter of the year 1740, when these birds destroyed all the corn near the sea-coasts, by tearing it up by the roots. A general war for this reason was declared against them, and carried on in earnest, by knocking them on the head with clubs; but their numbers were so prodigious, that this availed but little: nor were the inhabitants relieved from this scourge till the north wind which had brought them ceased to blow, when they took leave. They easily become tame; and, being fatted, are thought to be a delicate food. They breed pretty far north, returning southward in autumn. They fly in the shape of a wedge, like the wild geese, with great clamour. They are called in Shetland, *Horra geese*, from being found in that sound. They are common also in America: breeding in the islands, and along the coast, and feed about high-water mark. Their food consists of plants, such as the small bistort, and black-berried heath, sea-worms, berries, and the like. They are apt to have a fishy taste, but are in general thought good food. The same fable has been told of this bird as of the bernacle, in respect to its being bred from trees. Called at Hudson's-Bay, *Wetha may pa wew*.

16. The canadensis is brown; its head and neck are black, and the throat is white. It measures three and an half feet in length. It is found during the summer in Hudson's-Bay, and parts beyond; also in Greenland; and, in the summer months, in various parts of North-America, as far as Carolina. Numbers breed at Hudson's-Bay, and lay six or seven eggs; but the major part retire still farther north. Their first appearance in the Bay is from about the middle of April to about the middle of May, when the inhabitants wait for them with impatience, being one of the chief articles for food, and many years kill 3000 or 4000, which are salted and barrelled. Their arrival is the harbinger of spring, and the month is named by the Indians the *goose-moon*. The British send out their servants, as well as Indians, to shoot these birds on their passage. It is in vain to pursue them; they therefore form a row of huts made of boughs, at musket-shot distance from each other, and place them in a line across the vast marshes of the country. Each hovel, or, as they are called, *stand*, is occupied by only a single person. These attend the flight of the birds, and on their approach mimic their cackle so well, that the geese will answer, and wheel, and come nearer the stand. The sportsman keeps motionless, and on his knees, with his gun cocked, the whole time; and never fires till he has seen the eyes of the geese. He fires as they are going from him, then picks up another gun that lies by him, and discharges that. The geese which he has killed he sets upon sticks as if alive, to decoy others; he also makes artificial birds for the same purpose. In a good day (for they fly in very uncertain and unequal numbers) a single Indian will kill 200. Notwithstanding every species of goose has a different call, yet the Indians are admirable in their imitation of every one. In this sport, however, they must be very careful to secrete themselves; for the birds are very shy, and on the least motion fly off directly. On their return south, which is from the middle of August to the middle of October, much havoc is made among them; but these are preserved fresh for winter store, but putting them, feathers and all, into a large hole dug in the ground, and covering them with mould; and these, during the whole time of the frost's lasting, are found perfectly sweet and good. The Indians at Hudson's Bay call them *Apistiskish*. This species is now pretty common, in a tame state, both on the continent and in England; on the great canal of Versailles hundreds are seen mixing with the swans with the greatest cordiality; and the same at Chantilly. In England, likewise, they are thought a great ornament to the pieces of water

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in many gentlemens ſeats where they are very familiar, and breed freely. The fleſh of the young birds is accounted good; and the feathers equal to thoſe of other geeſe, in ſo much as to prove an article of commerce much in the favour of thoſe places where they are in ſufficient numbers.

17. The molliſſima, or eider-duck, is double the ſize of the common duck, has a cylindrical bill, and the wax is divided behind, and wrinkled. The feathers which are very ſoft and valuable, fall off during incubation. The male is white above, but black below and behind: the female is greeniſh. This ſpecies is found in the Weſtern Iſles of Scotland, particularly on Oranſa, Barra, Rona, and Heiſker, and on the Farn Iſles; but in greater numbers in Norway, Iceland and Greenland; from whence a vaſt quantity of the down, known by the name of *eider* or *edder*, which theſe birds furniſh, is annually exported. Its remarkably light, elaſtic, and warm qualities, make it highly eſteemed as a ſtuffing for coverlets, by ſuch whom age or infirmities render unable to ſupport the weight of common blankets. This down is produced from the breaſt of the birds in the breeding ſeaſon. It lays its eggs among the ſtones or plants near the ſhore; and prepares a ſoft bed for them, by plucking the down from its own breaſt: the natives watch the opportunity, and take away both eggs and neſt: the ducks lays again, and repeats the plucking of its breaſt: if ſhe is robbed after that, ſhe will ſtill lay; but the drakes muſt ſupply the down, as her ſtock is now exhauſted: but if her eggs are taken a third time, ſhe wholly deſerts the place. See Down.

Theſe birds are not numerous on the iſles; and it is obſerved that the drakes keep on thoſe moſt remote from the ſitting places. The ducks continue on their neſts till you come almoſt cloſe to them; and when they riſe, are very ſlow fliers. The number of eggs in each neſt are from three to five, warmly bedded in the down; of a pale olive colour; and very large, gloſſy, and ſmooth. They now and then, however, lay ſo many as eight; for Van Troil informs us that no leſs than 16 have been found in one neſt, with two females, who agree remarkably well together.—In America, this bird is found as far ſouth as New-York, and breeds on the deſart iſles of New-England; but moſt common every where to the north. They are ſaid to be conſtant to the ſame breeding places, and that a pair has been obſerved to occupy the ſame neſt for 20 years together. They take their young on their backs inſtantly to ſea; then dive, to ſhake them off and teach them to ſhift for themſelves. It is ſaid, that the males are five years old before they come to their full colour; that they live to a great age, and will at length grow quite grey. Their food is ſhells, for which they dive to great depths. They are very numerous in the Eſquimaux lands, where, and in Greenland, they are called *mettek*. The natives kill them on the water with darts, ſtriking them the moment they appear after diving; and know the place from their being preceded by the riſing of bubbles. The fleſh is ſaid to be much valued.

18. The maula, or ſcaup-duck, is leſs than the common duck. The bill is broad, flat, and of a greyiſh blue colour; the head and neck are black, gloſſed with green; the breaſt is black; the back, the coverts of the wings, and the ſcapulars, are finely marked with numerous narrow tranſverſe bars of black and grey; the legs are duſky. Mr Willoughby acquaints us, that theſe birds take their name from feeding on ſcaup, or broken ſhell-fiſh; they differ infinitely in colours, ſo that in a flock of 40 or 50 there are not two alike.

19. The muſchata, or Muſcovy duck of Ray, has a naked papillous face, and is a native of India.—It is bigger than the wild duck, being in length two feet. This ſpecies is pretty common in a domeſticated ſtate in almoſt every nation; and the breed ought to be encouraged, as there is more fleſh on it than on the common duck, and of a very high flavour. The eggs are rounder than thoſe of a duck, and in young birds frequently incline to green. They lay more eggs, and ſit oftener than other ducks. In an unconfined ſtate, they make the neſt on the ſtumps of old trees, and perch during the heat of the day on the branches of ſuch as are well clothed with leaves. When kept tame, they are ſufficiently docile; and the male will not unfrequently aſſociate and produce a mongrel breed with the common ducks. The name of Muſcovy duck was given to them from their exhaling a muſky odour, which proceeds from the gland placed on the rump in common with other birds.

20. The clypeata, or ſhovelar of Ray, has the end of its bill broad, rounded, and furniſhed with a ſmall hook. It is in length 21 inches; the female a trifle ſmaller. Both ſexes are apt to vary much in colour: the male likewiſe differs from the female inwardly, having juſt above the divarication of the windpipe where it paſſes into the lungs, an enlargement, or, as it is called by ſome, a *labyrinth*.—This bird is now and then met with in England, though not in great numbers. It is ſaid to come into France in February, and ſome of them to ſtay during the ſummer. It lays 10 or 12 rufous-coloured eggs, placed on a bed of ruſhes, in the ſame places as the ſummer-teal; and departs in September, at leaſt the major part of them, for it is rare that one is ſeen in winter. The chief food of this bird is inſects, for which it is continually muddling in the water with its bill. It is alſo ſaid dexterouſly to catch flies which paſs in its way over the water. Shrimps, among other things, have been found in its ſtomach on diſſection. This ſpecies is alſo found in moſt parts of Germany; throughout the Ruſſian dominions, as far as Kamtſchatka; and in North-America, in New-York and Carolina, during the winter ſeaſon. It is accounted pretty good food.

21. The ſtrepera, or gad-wall, has the wings variegated with black, white, and red. It inhabits England in the winter months, and is alſo found at the ſame ſeaſon in various parts of France and Italy. It migrates as far as Sweden, as ſummer advances, in order to breed; and found throughout Ruſſia and Siberia, except in the eaſtern part of the laſt, and Kamtſchatka. Being a very quick diver, it is difficult to be ſhot. It feeds morning and evening only, being hid among the reeds and ruſhes during the day. The noiſe it makes is not unlike that of a mallard, but louder. The fleſh is good.

22. The clangula, or golden eye of Ray, is variegated with black and white, and the head is interſperſed with blackiſh green feathers: it has a white ſpot near the mouth; and the eyes are of a ſhining gold colour. It is not unfrequent on the ſea-coaſts in winter, and

and appears in ſmall flocks; but paſſes to the north in ſpring in order to breed. It inhabits Sweden and Norway during the ſummer. It is an excellent diver, and feeds on ſmall ſhells. It is moſtly ſeen in the water, as it is very awkward in walking. It has been attempted to be domeſticated, but ſeems out of its element on land. With difficulty it can be brought to eat any thing but bread; and the feet ſoon grow injured, inſomuch as at laſt to hinder it from walking. The fleſh is much eſteemed, and the birds are often ſeen in the market at the proper ſeaſon. This ſpecies is found in America; in winter as low as New-York; in ſummer, at Hudſon's bay, where it frequents the freſh-water lakes, and makes in hollow trees a round neſt of graſs lined with feathers from its breaſt; lays from ſeven to ten white eggs.

23. The merſa, or Ural duck of Pallas, is ſomewhat bigger than the common teal. The bill is large, broad, very tumid above the noſtrils, and bifid in the adult bird, the end marked with diverging ſtriæ; colour blue: the head, and part of the neck, are white; on the crown is a large patch of black: the middle of the neck is black: the fore-parts of the body are a yellowiſh brown, undulated with black: the back is clouded with a cinerous and pale yellow, powdered with brown: the wings are ſmall; the tail longiſh, wedge-ſhaped, and black: the legs are brown, on the fore-part bluiſh, and placed as far back as in the diver genus. This ſpecies is not unfrequent in the greater lakes of the Ural mountains, and the rivers Ob and Irtiſch. It is not ſeen on the ground, for from the ſituation of its legs it is unable to walk; but it ſwims very well and quick: at which time the tail is immerſed in the water as far as the rump, ſerving by way of rudder, contrary to the common method of a duck's ſwimming. The neſt is formed of reeds, and floats, ſomething like to that of the grebe.

24. The American wigeon (*le canard jenſen* of Buffon), is rather bigger than the European wigeon. The bill is of a lead colour: the crown and forehead of a yellowiſh white: the hind-part of the neck and head is black and white, ſpeckled; and behind the eye is a black mark, changing in ſome lights to green: the back and ſcapulars are of a pale ruſt-colour, waved with tranſverſe black lines; in the middle of the wing coverts there is a large bed of white: the quills and tail are deep brown: the legs duſky. It inhabits North-America, from Carolina to Hudſon's Bay; but is no where a common bird. It is called at New-York the *Pheaſant Duck*. It is more plenty at St Domingo and Cayenne, where it is called *vingeon* or *gingeon*. At Martinico great flocks of them often take ſhort flights from one rice plantation to another, where they make much havoc, particularly during the rainy ſeaſon. They are ſaid to perch on trees. They feed in company and have a centinel on the watch like ſome other birds. They are ſeldom ſeen during the day, lying hid in places ſhaded from the ſun: but ſo ſoon as that luminary diſappears, they come forth from their hiding-places to feed; and, during this, make a particular kind of noiſe, by which the ſportſman is directed in his ſearch after them: at other times their note is a kind of ſoft whiſtle, which is often imitated in order to decoy them within reach of the gun. They ſit in January; and in March the young are ſeen running about. They lay many eggs. Sometimes theſe are hatched under hens; in which caſe they are, while young, familiar, though when grown up exceedingly quarrelſome with other ducks; their fleſh is moſt excellent, eſpecially ſuch as are brought up tame. They appear upon the coaſt of Hudſon's Bay in May, as ſoon as the thaws come on, chiefly in pairs: they lay there only from ſix to eight eggs; and feed on flies and worms in the ſwamps. They depart in flocks in autumn. They are known by the name of *atheikimo aſheep*.

25. The acuta, pin-tail, or ſea-pheaſant of Ray, has a long acuminated tail, black below, with a white line on each ſide of the back part of the head. It is a native of Europe. Mr Hartlib, in the appendix to his *Legacy*, tells us, that theſe birds are found in great abundance in Connaught in Ireland, in the month of February only; and that they are much eſteemed for their delicacy.

26. The glacialis, or long-tailed duck, is inferior in ſize to the former. The bill is ſhort, black at the tip and baſe, orange-coloured in the middle; the cheeks are of a pale brown; the hind part of the head, and the neck both before and behind, are white, the breaſt and back are of a deep chocolate colour; the four middle feathers of the tail are black, and two of them near four inches longer than the others, which are white; the legs duſky. Theſe birds breed in the moſt northern parts of the world; and only viſit the Britiſh coaſts in the ſevereſt winters. It breeds in Hudſon's Bay and Greenland, among the ſtones and graſs, making its neſt, like the eider, with the down of its own breaſt, which is equal in value to that of the eider, if it could be got in equal quantity; but the ſpecies is ſcarcer. It lays five eggs; ſwims and dives admirably; and feeds on ſhell-fiſh, which it gets in very deep water. It flies irregularly, ſometimes ſhowing its back, ſometimes its belly. It continues in Greenland the whole year, in unfrozen places; but there are ſeaſons ſo very ſevere, as at times to force them towards the ſouth. Thoſe which breed between Lapland and the polar circle, are often driven into Sweden and the neighbourhood of Peterſburgh: thoſe from the coaſt of the Icy ſea, as low as lat. 55; but on the ſetting in of froſt, they retire ſtill further ſouth, unleſs where ſome open ſpots remain in the rivers. They viſit the freſh-water lakes in the Orkneys, in October, and continue there till April. At ſun-ſet they are ſeen, in great flocks, returning to and from the bays, where they frequently paſs the night, and make ſuch a noiſe as to be heard ſome miles in froſty weather.

27. The ferina, pochard, or red-headed wigeon of Ray, has a lead-coloured bill: the head and neck are of a bright gay colour: the breaſt and part of the back where it joins the neck are black: the coverts of the wings, the ſcapulars, back, and ſides under the wings, are of a pale grey, elegantly marked with narrow lines of black: the tail conſiſts of twelve ſhort feathers of a deep grey colour: the legs are lead coloured; and the irides of a bright yellow, tinged with red. The head of the female is of a pale reddiſh brown. In England theſe birds frequent the fens in the winter ſeaſon, and are carried to the London markets ſometimes in conſiderable numbers, where they are known by the name of *Dun Birds*, and are eſteemed excellent eating. In winter, they paſs pretty far to the ſouth, being found in Egypt, about Cairo.

They

They come into France the end of October in small flocks, from 20 to 40; and are found in Carolina in winter. They feed on small fish and shells. Their flight is rapid and strong; but the flocks form no particular shape in flying.

28. The querquedula, garganey, or first teal of Aldrovandus, has a green spot on the wings, and a white line above the eyes. It frequents the fresh waters of Europe. In many places it is called the *summer-teal*.

29. The creca, or common teal, has a green spot on the wings, and a white line both above and below the eyes. It is of a small size, only 14 inches in length. The teal is frequent in the London markets along with the wild duck. It is met with in Duddingston-loch, a fresh-water lake, within a mile of Edinburgh. In France it stays throughout the year, and makes a nest in April among the rushes, on the edges of ponds; it is composed of the tenderest stalks of them, with the addition of the pith, and a quantity of feathers. The nest is of a large size, and placed in the water, so as to rise and fall with it. The eggs are the size of those of a pigeon, of a dirty white, marked with small hazel spots. It is said to feed on the grass and weeds which grow on the edges of the ponds which it frequents, as well as the seeds of the rushes; it will also eat small fish. The flesh is accounted excellent. It is found to the north as high as Iceland; and is mentioned as inhabiting the Caspian sea to the south.

30. The histrionica, or dusky spotted duck of Edwards, is of a brown colour, variegated with white and blue; it has a double line on the ears and temples; the collar is white, and there is a white streak on the neck. It inhabits from Carolina to Greenland: in the last it frequents, during summer, the rapid rivers, and the most shady parts; nestling on the banks, among the low shrubs. It swims and dives admirably. In winter it seeks the open sea, flies high and swiftly, and is very clamorous. It feeds on shell-fish, spawn, and the larvæ of gnats. Is found in Iceland, and as low as Sondmor. It is common from the lake Baikal to Kamtschatka; and breeds there, as well as every where else, about the most rocky and rapid torrents.

31. The minuta, or little white and brown duck of Edwards, is of a greyish colour, with white ears, and the prime feathers of the wings blackish. This and the former, according to Latham, are found both on the Old and new continents. On the first, it is seen as far south as the lake Baikal, and from thence to Kamtschatka, particularly up the river Ochotska; also in Iceland, and as low as Sondmor. In America, it is found from Carolina to Newfoundland, and Hudson's Bay; also in Greenland, where it frequents, during summer, bays and rivers, especially near their mouths, and is a very noisy species. It is fond of shady places, and makes its nest on the shore among the shrubs. Its food is small shells, eggs of fishes, and particularly the larvæ of gnats. It swims well, even in the most rapid streams; and dives to admiration: it likewise flies swift, and to a great height: from which circumstances, it is not easily taken. Late navigators met with it at Aoonalashka. It is pretty frequent in the small rivulets of Hudson's Bay, about 90 miles inland; seldom in large rivers. It lays 10 or more white eggs, like those of the pigeon, on the grass; and the young brood speckled in a very pretty manner. It migrates south in autumn.

32. The boschas, common wild-duck of Ray, or mallard; the intermediate tail-feathers of the drake are turned backward, and the bill is strait. It frequents the lakes of different countries, and feeds upon frogs and several sorts of insects.—The wild-ducks pair in the spring: build their nests among rushes near the water, and lay from 10 to 16 eggs. The female is a very artful bird; and does not always make the nest close to the water, but frequently at a good distance from it; in which case the duck will take the young in its beak or between its legs. It is known sometimes to lay the eggs in a high tree, in a deserted magpie's or crow's nest. At moulting-time, when they cannot fly, they are caught in great numbers. They abound greatly in Lincolnshire, the great magazine of wild-fowl in Great Britain; where prodigious numbers are taken annually in the DECOYS. Birds with flat bills, that find their food by groping, have three pair of nerves that extend to the end of their bills: these nerves are remarkably conspicuous in the head and bill of the wild-duck, and, are larger than those of a goose or any other bird yet known: this is the reason they grope for food more than any other bird whatever.—The common tame species of ducks take their origin from these, and may be traced to it by unerring characters. The drakes, howsoever they vary in colours, always retain the curled feathers of the tail, and both sexes the form of the bill, of the wild kind. Nature sports in the colours of all domestic animals; and for a wise and useful end, that mankind may the more readily distinguish and claim their respective property.

In France this species is not often seen, except in winter; appearing in October, and going north in spring. They are caught in various manners; among the rest, in decoys, as in England; the chief place for which is Picardy, where prodigious numbers are taken, particularly on the river Somme. It is also customary there to wait for the flocks passing over certain known places, and the sportsman, having a wicker cage, containing a quantity of tame birds, lets out one at a time, at a convenient season, which enticing the passengers within gunshot, five or six are often killed at once by an expert marksman. They are now and then taken also by a hook baited with a bit of sheep's lights, which swimming on the water, the bird swallows the bait, and with it the hook. Various other means of catching ducks and geese are peculiar to certain nations; of which one seems worth mentioning from its singularity: The person wishing to take these, wades into the water up to the chin, and having his head covered with an empty calabash, approaches the place where the ducks are; when they, not regarding an object of this sort, suffer the man freely to mix with the flock; after which he has only to pull them by the legs under the water, one after another, till he is satisfied; returning as unsuspected by the remainder as when he first came among them. This method is frequently put into practice on the river Ganges, using the earthen vessels of the Gentoos instead of the calabashes: these vessels are what the Gentoos boil their rice in, and are called Kutcharee pots (they likewise make a dish for the tables in them, which goes by the same name): after these are once used they look upon them as defiled, and in course throw them into the river as useless; and the duck-takers find them convenient for their purpose, as the ducks,

ducks, from constantly seeing the vessels float down the stream, look upon them as objects of full as little regard as a calabash. The above, or some such method, is also practised in China as well as in India. The Chinese, however, though they make great use of ducks, do not prefer the wild sort, being in general extremely fond of tame ones: and it is said that the major part of these are hatched by artificial heat; the eggs, being laid in boxes of sand, are placed on a brick hearth, to which is given a proper heat during the time required for hatching. The ducklings are fed with little craw-fishes and crabs, boiled and cut small, and afterwards mixed with boiled rice; and in about a fortnight shift for themselves, when the Chinese provide them an old stepmother, who leads them where they are to find provender for themselves; being first put on board a sampane or boat, which is destined for their habitation, and from which the whole flock, often to the amount of 300 or 400, go out to feed, and return at command. This method is used nine months out of the twelve (for in the colder months, it does not succeed; and is so far from a novelty, that it may be every where seen; but more especially about the time of cutting the rice and gleaning the crop, when the masters of the duck sampanes row up and down the river according to the opportunity of procuring food, which is found in plenty, at the tide of ebb, on the rice plantations, as they are overflowed at high water. It is curious to see how the ducks obey their master; for some thousands, belonging to different boats, will feed at large on the same spot, and on a signal given will follow their leader to their respective sampanes, without a stranger being found among them*. This is still more extraordinary, if we consider the number of inhabited sampanes on the Tigris, supposed to be no less than 40,000, which are moored in rows close to each other, with a narrow passage at intervals for boats to pass up and down the river. The Tigris, at Canton, is somewhat wider than the Thames at London, and the whole river is there covered in this manner for the extent of at least a mile. See *Cook's last voyage*, iii. 443.

* *Osbec & Toreen's Voyage*, i. 194. ii. 255.

33. The galericulata, or Chinese teal of Edwards, has a hanging crest; and on the hinder part of the back, on both sides, there is a crooked, flat, elevated feather; the crest is green and red; and the back is brown, and spotted with blue; the erect feathers on the back are red and blunt; one edge of the inmost wing-feather, when the wings are shut, is raised over the back, and is red, and like a sickle before. This most singular and elegant species is a native of China and Japan, where it is kept by the inhabitants for the sake of its beauty. It is not near so common in China as many other kinds, or perhaps they are politically held dear to the European purchasers; they are frequently exposed to sale at Canton in cages, and the common price is from six to ten dollars per pair: they are not unfrequently carried to England alive; but require care, as they seem more tender than our species. Attempts have been made to breed them in England, but without success, though they are familiar enough. The bird is known in Japan by the name of *Kimnodsui*. The English in China give it the name of *mandarin duck*.

34. The sponsa, or summer-duck of Catesby, is a most elegant species. It has a depending green crest, variegated with blue and white; the back is likewise variegated with blue and white; the breast is grey, and spotted with white; and the throat is white. It inhabits Mexico, and some of the West-India isles, migrating in the summer season as far north as 40 degrees, or a little beyond. It appears at New-York early in the spring, and breeds there; making its nest in the decayed hollows of trees, or such as have been made by woodpeckers, and often between the forks of the branches; and when the young are hatched, the mother takes them on her back to the water. The flesh is much esteemed. This is the species, the neck of which the natives of Louisiana use to ornament their pipes or calumets of peace with; and at the last-named place it is found throughout the year.

35. The aborea, or black-billed whistling duck of Edwards, is of a reddish brown colour, with a sort of crest on the head; the belly is spotted with black and white. It is a native of America. Sloane informs us, that this duck perches on trees; that it is about 20 inches long from the end of the bill to the point of the tail; and that it makes a kind of whistling noise, from which circumstance it has received its name.

36. The fuligula, or tufted duck of Ray, has a hanging crest, a black body, and the wings and belly spotted with white. This species is found in Europe as far as Norway. In the winter months it is not unfrequent in England; being met with in the markets in that season, and is much esteemed. It is common also throughout the Russian empire, going northward to breed. Is frequent in Kamtschatka. The male disappears during the incubation of the female.

There are 62 other species enumerated by ornithologists; the whole number hitherto described being 98.

ANASARCA, a species of dropsy. See MEDICINE.

ANASSUS, or ANAXUS (anc. geog.), a river in the territory of Venice, (Pliny); now the *Piave*, which rising from the mountains of Tyrol, not far from the borders of Carinthia, runs from north to south, thro' the territories of Cadorina, Belluno, Feltre, and, after running from west to east, through Trevigi, falls into the Adriatic, 13 miles to the south-east of Venice.

ANASTASIS, a term among ancient physicians, for a rising up to go to stool. It also signifies the passage of any humour, when expelled from one part, and obliged to remove to another.

ANASTASIUS I. emperor of the east, succeeded Zeno in the year 491, and was inaugurated that same year on April the 11th. The Manicheans and Arians were greatly in hopes of being supported by the new emperor; the former because his mother was their friend, and favoured their sect; the latter because the emperor's uncle was of their opinion: but if Anastasius did not persecute them (as we do not find he ever did), yet it does not appear that he supported either of these sects. But in order to maintain the peace of the church, upon which the tranquility of the state very much depended, he declared, that such bishops or other clergymen who should disturb the public tranquility, by maintaining with too much heat either side of the question for or against the Council of Chalcedon, should be deprived of their benefices. Accordingly the disputes concerning Eutychianism running to a very great height, and Euphemius being deeply concerned

Anastasius.

cerned in them, the emperor expelled him from his see, and chose Macedonius in his stead. The hatred which the different parties entertained against one another occasioned often such tumults and seditions at Constantinople, as threatened the life of the emperor himself; who, to keep the people in awe, ordered that the governor of the city should be present at all church-assemblies and public processions. This was so much the more necessary, because these tumults were chiefly occasioned by a kind of doxology or short hymn which used to be sung at divine service. This doxology consisted only of the following words, *αγιος ο Θεος, αγιος ισχυρος, αγιος αθανατος*, that is, "Holy God, holy the powerful, holy the immortal;" for which reason it was called *τρισαγιος*, *Trisagius*, "three times holy;" because the word *holy* was therein three times repeated. The orthodox used to sing that hymn without any addition, or by adding only to it, *αγια τριας, ελεησον ημας*, i. e. "Holy Trinity, have mercy upon us:" But Peter the Fuller, bishop of Antioch, pretended to add these words to it, viz. *ο σταυρωθεις δι ημας*, i. e. "who hast been crucified for us;" and as it was supposed that the first holy related to the Father, the second to the Son, the third to the Holy Ghost, and adding these words, *who hast been crucified for us*, seemed to insinuate that the whole consubstantial Trinity had suffered; for which reason the orthodox were resolved not to admit this addition. Anastasius desiring to have those fatal words added to that hymn whenever it should be sung at Constantinople, this occasioned a terrible sedition in the city, as though the very fundamentals of Christianity had been overthrown. Macedonius and his clergy are said to have raised that sedition, which came to such a height that the emperor himself was obliged to come, without his crown on his head, and in a very humble manner, to the Circus, where he declared to the people that he was very williing to quit the imperial throne; but he told them at the same time, that they could not all enjoy the sovereign power, which does not admit of a partnership; and that one person still must govern them if he resigned the crown. This discourse had such a power over the raging multitude, that, as if they had been divinely inspired, they immediately requested the emperor to take up his crown, promising that they would be quiet and obedient for the future. Anastasius is by the Popish writers represented as a great persecutor of the orthodox, because he banished and deprived Euphemius and Macedonius; but they should prove that these two prelates had been unjustly banished, which is a very hard task. As to his civil government, it is confessed that at the beginning of his reign he shewed himself a very good prince; he eased the people of a very heavy tax called *Chrysargyrum*, under which they had groaned for a long time; he prohibited the fighting with wild beasts; he raised several buildings; he avoided being involved in dangerous wars as much as lay in his power. Anastasius reigned 27 years three months and three days, or, according to F. Pagi, wanting three days; and died July the 10th, A. C. 518, in the 88th year of his age.

ANASTASIUS, surnamed *Bibliothecarius*, a Roman abbot, library-keeper of the Vatican, and one of the most learned men of the ninth century, assisted in 869 at the fourth general council, the acts and canons of which he translated from the Greek into Latin. He also composed the lives of several popes, and other works; the best edition of which is that of the Vatican.

Anastatica || Anasus.

ANASTATICA, the ROSE of JERICHO: A genus of the siliculosa order, belonging to the tetradynamia class of plants; and, in the natural method, ranking under the 39th order, *Siliquosæ*. The characters are: The *calyx* is a perianthium consisting of four leaves, and persistent: The *corolla* consists of four cruciform petals: The *stamina* consist of six subulated filaments the length of the calyx; the anthera are roundish: The *pistillum* has a small bifid germen; the stylus mucronated and oblique; the stigma headed: The *pericarpium* is a short bilocular silicle, retuse, and crowned on on the margin with valvulæ twice as long as the partition: The *seeds* are solitary and roundish.—Of this genus there are two

Species. 1. The syriaca, a native of Syria, is not cultivated or known in Britain. 2. The hierochuntica is a native of the sandy parts of Palestine and the Red Sea. It is a low annual plant, dividing into many irregular woody branches near the root. At each joint is placed a single, oblong, hairy leaf; and at the same places come out small single flowers, of a whitish green colour, composed of four leaves placed in the form of a cross. These are succeeded by short wrinkled pods, having four small horns; these open into four cells, in each of which is lodged a single brown seed—When the seeds of this plant are ripe, the branches will draw up and contract; so that the whole plant forms a kind of ball or globular body, which will expand on laying it a short time in warm water. This property it retains for many years, on which account it is preserved as a curiosity by some people. From this property the monks have given it the name of *Rosa Mariæ*, pretending that the flowers open on the night in which our Saviour was born.

Culture. This plant is propagated by seeds, which should be sown in the beginning of March, in a moderate hot-bed in pots, in which the plants are designed to remain. When they come up, the plants should be thinned, leaving them about six inches asunder, and observing to keep them clear of weeds, which is all the care they require. If the season proves favourable they will flower in August; but unless the autumn proves warm and dry, they will not perfect their seeds in Britain.

ANASTOMOSIS, in anatomy, the opening of the mouths of vessels, in order to discharge their contained fluids. It is likewise used for the communication of two vessels at their extremities; as the inosculation of a vein with a vein, of an artery with an artery, or of an artery with a vein.

ANASTOMATICS, medicines supposed to have the power of opening the mouths of the vessels, and promoting the circulation; such as deobstruent, cathartic, and sudorific medicines.

ANASTROPHE, in rhetoric and grammar, denotes the inversion of the natural order of the words: such is, *saxa per et scopulos*, for *per saxa et scopulos*.

ANASUS, or ANISUS (anc. geog.) now the *Ens*, a river of Germany; which, rising on the borders of the

the territory of Saltzburg, then separating Upper Stiria from Upper Austria, and washing the town of Ens, falls, at the distance of a mile below it, into the Danube, in a course from south to north.

ANATHEMA, among ecclesiastical writers, imports whatever is set apart, separated, or divided; but is most usually meant to express the cutting off a person from the privileges of society and communion with the faithful.

The anathema differs from excommunication in the circumstances of being attended with curses and execrations. It was practised in the primitive church against notorious offenders; and the form of that pronounced by Synecius against one Andronicus, is as follows: "Let no church of God be open to Andronicus, but let every sanctuary be shut against him. I admonish both private men and magistrates, to receive him neither under their roof nor to their table; and priests more especially, that they neither converse with him living, nor attend his funeral when dead."

Several councils also have pronounced anathemas against such as they thought corrupted the purity of the faith; and their decisions have been conceived in the following form: *Si quis dixerit, &c. anathema sit.*

There are two kinds of anathemas, the one judiciary, and the other abjuratory. The former can only be denounced by a council, a pope, or a bishop; the latter makes a part of the ceremony of abjuration, the convert being obliged to anathematize the heresy he abjures.

ANATHEMA, in heathen antiquity, was an offering or present made to some deity, and hung up in the temple. Whenever a person left off his employment, it was usual to dedicate the tools to the patron-deity of the trade. Persons, too, who had escaped from imminent danger, as shipwreck and the like, or had met with any other remarkable instance of good fortune, seldom failed to testify their gratitude by some present of this kind.

ANATHOTH, a hamlet of Palestine, very near Jerusalem (Josephus), about three miles and a half to the north; the ruins of which are still to be seen. It was the birth-place of the prophet Jeremiah, and one of the Levitical towns in the tribe of Benjamin.

ANATIFERA CONCHA, the trivial name of a species of the lepas, a testaceous animal. See LEPAS.

ANATOCISM, ANATOCISMUS, an usurious contract, wherein the interests arising from the principal sum are added to the principal itself, and interest exacted upon the whole. The word is originally Greek, but used by Cicero in Latin; whence it has descended into most other languages. It comes from the preposition ανα, which in composition signifies *repetition* or *duplication*, and τοκος, *usury*. Anatocism is what we properly called *interest upon interest*, or *compound interest*. This the worst kind of usury, and has been severely condemned by the Roman law, as well as by the common laws of most other countries. See INTEREST.

ANATOLIA. See NATOLIA.

A N A T O M Y,

THE art of dissecting, or artificially separating and taking to pieces, the different parts of the human body, in order to an exact discovery of their situation, structure, and œconomy.—The word is Greek, ανατομη; derived from ανατεμνω, to dissect, or separate by cutting.

INTRODUCTION.

§ 1. *History of Anatomy.*

THIS art seems to have been very ancient; though for a long time, known only in an imperfect manner.—The first men who lived must have soon acquired some notions of the structure of their own bodies, particularly of the external parts, and of some even of the internal, such as bones, joints, and sinews, which are exposed to the examination of the senses in living bodies.

This rude knowledge must have been gradually improved, by the accidents to which the body is exposed, by the necessities of life, and by the various customs, ceremonies, and superstitions, of different nations. Thus, the observance of bodies killed by violence, attention to wounded men, and to many diseases, the various ways of putting criminals to death, the funeral ceremonies, and a variety of such things, must have shown men every day more and more of themselves; especially as curiosity and self-love would here urge them powerfully to observation and reflection.

The brute-creation having such an affinity to man in outward form, motions, senses, and ways of life; the generation of the species, and the effect of death upon the body, being observed to be so nearly the same in both; the conclusion was not only obvious, but unavoidable, that their bodies were formed nearly upon the same model. And the opportunities of examining the bodies of brutes were so easily procured, indeed so necessarily occurred in the common business of life, that the huntsman in making use of his prey, the priest in sacrificing, the augur in divination, and, above all, the butcher, or those who might out of curiosity attend upon his operations, must have been daily adding to the little stock of anatomical knowledge. Accordingly we find, in fact, that the South-sea-islanders, who have been left to their own observation and reasoning, without the assistance of letters, have yet a considerable share of rude or wild anatomical and physiological knowledge. Dr Hunter informs us, that when Omai was in his museum with Mr Banks, though he could not explain himself intelligibly, they plainly saw that he knew the principal parts of the body, and something likewise of their uses; and manifested a great curiosity or desire of having the functions of the internal parts of the body explained to him; particularly the relative functions of the two sexes, which with him seemed to be the most interesting object of the human mind.

We may further imagine, that the philosophers of the

the moſt early ages, that is, the men of curioſity, obſervation, experience and reflection, could not overlook an inſtance of natural organization, which was ſo intereſting, and at the ſame time ſo wonderful, more eſpecially ſuch of them as applied to the ſtudy and cure of diſeaſes. We know that phyſic was a branch of philoſophy till the age of Hippocrates.

Thus the art muſt have been circumſtanced in its beginning. We ſhall next ſee from the teſtimony of hiſtorians and other writers, how it actually appeared as an art, from the time that writing was introduced among men; how it was improved and conveyed down to us through a long ſeries of ages.

Civilization, and improvements of every kind, would naturally begin in fertile countries and healthful climates, where there would be leiſure for reflection, and an appetite for amuſement. Accordingly, writing, and many other uſeful and ornamental inventions and arts, appear to have been cultivated in the eaſtern parts of Aſia long before the earlieſt times that are treated of by the Greek or other European writers; and that the arts and learning of thoſe eaſtern people were in ſubſequent times gradually communicated to adjacent countries, eſpecially by the medium of traffic. The cuſtoms, ſuperſtitions, and climate of eaſtern countries, however, appear to have been as unfavourable to practical anatomy, as they were inviting to the ſtudy of aſtronomy, geometry, poetry, and all the ſofter arts of peace.

Animal bodies there, run ſo quickly into nauſeous putrefaction, that the early inhabitants muſt have avoided ſuch offenſive employments, as anatomical inquiries, like their poſterity at this day. And, in fact, it does not appear, by the writings of the Grecians, or Jews, or Phœnicians, or of other eaſtern countries, that anatomy was particularly cultivated by any of thoſe eaſtern nations. In tracing it backwards to its infancy, we cannot go farther into antiquity than the times of the Grecian philoſophers. As an art in the ſtate of ſome cultivation, it may be ſaid to have been brought forth and bred up among them as a branch of natural knowledge.

The æra of philoſophy, as it was called, began with Thales the Mileſian being declared by a very general conſent of the people, the moſt wiſe of all the Grecians, 480 years before Chriſt. The philoſophers of his ſchool, which was called the Ionian, cultivated principally natural knowledge. Socrates, the ſeventh in ſucceſſion of their great teachers, introduced the ſtudy of morals, and was thence ſaid to bring down philoſophy from heaven, to make men truly wiſe and happy.

In the writings of his ſcholar and ſucceſſor Plato, we ſee that the philoſophers had carefully conſidered the human body, both in its organization and functions; and though they had not arrived at the knowledge of the more minute and intricate parts, which required the ſucceſſive labour and attention of many ages, they had made up very noble and comprehenſive ideas of the ſubject in general. The anatomical deſcriptions of Xenophon and Plato have had the honour of being quoted by Longinus (§ xxxii.) as ſpecimens of ſublime writing: and the extract from Plato is ſtill more remarkable for its containing the rudiments of the circulation of the blood. "The heart (ſays Plato) is the centre or knot of the blood veſſels; the ſpring or fountain of the blood which is carried impetuouſly round; the blood is the *pabulum* or food of the fleſh; and, for the purpoſe of nouriſhment, the body is laid out into canals, like thoſe which are drawn through gardens, that the blood may be conveyed, as from a fountain, to every part of the pervious body."

Hippocrates was nearly contemporary with the great philoſophers of whom we have been ſpeaking, about 400 years before the Chriſtian æra. He is ſaid to have ſeparated the profeſſion of philoſophy and phyſic, and to have been the firſt who applied to phyſic alone as the buſineſs of his life. He is likewiſe generally ſuppoſed to be the firſt who wrote upon anatomy. We know of nothing that was written expreſsly upon the ſubject before; and the firſt anatomical diſſection which has been recorded, was made by his friend Democritus of Abdera.

If, however, we read the works of Hippocrates with impartiality, and apply his accounts of the parts to what we now know of the human body, we muſt allow his deſcriptions to be imperfect, incorrect, ſometimes extravagant, and often unintelligible, that of the bones only excepted. He ſeems to have ſtudied theſe with more ſucceſs than the other parts, and tell us that he had an opportunity of ſeeing an human ſkeleton.

From Hippocrates to Galen, who flouriſhed towards the end of the ſecond century, in the decline of the Roman empire, that is, in the ſpace of 600 years, anatomy was greatly improved; the philoſophers ſtill conſidering it as a moſt curious and intereſting branch of natural knowledge, and the phyſicians, as a principal foundation of their art. Both of them, in that interval of time, contributed daily to the common ſtock, by more accurate and extended obſervations, and by the lights of improving philoſophy.

As theſe two great men had applied very particularly to the ſtudy of animal bodies, they not only made great improvements, eſpecially in phyſiology, but raiſed the credit of natural knowledge, and ſpread it as wide as Alexander's empire.

Few of Ariſtotle's writings were made public in his lifetime. He affected to ſay that they would be unintelligible to thoſe who had not heard them explained at his lectures: and, except the uſe which Theophraſtus made of them, they were loſt to the public for above 130 years after the death of Theophraſtus; and at laſt came out defective from bad preſervation, and corrupted by men, who, without proper qualifications, preſumed to correct and ſupply what was loſt.

From the time of Theophraſtus, the ſtudy of natural knowledge at Athens was forever on the decline; and the reputation of the Lycæum and Academy was almoſt confined to the ſtudies which are ſubſervient to oratory and public ſpeaking.

The other great inſtitution for Grecian education, was at Alexandria in Egypt. The firſt Ptolemies, both from their love of literature, and to give true and permanent dignity to their empire, and to Alexander's favourite city, ſet up a grand ſchool in the palace itſelf, with a muſeum and library, which, we may ſay, has been the moſt famed in the world. Anatomy, among other ſciences, was publicly taught; and the two diſtinguiſhed anatomiſts were Eraſiſtratus the pupil and friend of Theophraſtus, and Herophilus. Their voluminous

luminous works are all lost; but they are quoted by Galen almost in every page. These professors were probably the first who were authorized to dissect human bodies; a peculiarity which marks strongly the philosophical magnanimity of the first Ptolemy, and fixes a great æra in the history of anatomy. And it was, no doubt, from this particular advantage which the Alexandrians had above all others, that their school not only gained, but for many centuries preserved, the first reputation for medical education. Ammianus Marcellinus, who lived about 650 years after the schools were set up, says, they were so famous in his time, that it was enough to secure credit to any physician, if he could say he had studied at Alexandria.

Herophilus has been said to have anatomized 700 bodies. We must allow for exaggeration. Nay, it was said, that both he and Erasistratus made it a common practice to open living bodies, that they might discover the more secret springs of life. But this, no doubt, was only a vulgar opinion, rising from the prejudices of mankind; and accordingly, without any good reason, such tales have been told of modern anatomists, and have been believed by the vulgar.

Among the Romans, though it is probable they had physicians and surgeons from the foundation of the city, yet we have no account of any of these applying themselves to anatomy for a very long time. Archagathus was the first Greek physician established in Rome, and he was banished the city on account of the severity of his operations.—Asclepiades, who flourished in Rome 101 years after Archagathus, in the time of Pompey, attained such a high reputation as to be ranked in the same class with Hippocrates. He seemed to have some notion of the air in respiration acting by its weight; and in accounting for digestion, he supposed the food to be no farther changed than by a comminution into extremely small parts, which being distributed to the several parts of the body, is assimilated to the nature of each. One Cassius, commonly thought to be a disciple of Asclepiades, accounted for the right side of the body becoming paralytic on hurting the left side of the brain, in the same manner as has been done by the moderns, viz. from the crossing of the nerves from the right to the left side of the brain.

From the time of Asclepiades to the second century, physicians seem to have been greatly encouraged at Rome; and, in the writings of Celsus, Rufus, Pliny, Cœlius, Aurelianus, and Aræteus, we find several anatomical observations, but mostly very superficial and inaccurate. Towards the end of the second century lived Claudius Gallenus Pergamus, whose name is so well known in the medical world. He applied himself particularly to the study of anatomy, and did more in that way than all that went before him. He seems, however, to have been at a great loss for human subjects to operate upon; and therefore his descriptions of the parts are mostly taken from brute animals. His works contain the fullest history of anatomists, and the most complete system of the science, to be met with any where before him, or for several centuries after; so that a number of passages in them were reckoned absolutely unintelligible for many ages, until explained by the discoveries of succeeding anatomists.

About the end of the fourth century, Nimesius, bishop of Emissa, wrote a treatise on the nature of man, in which it is said were contained two celebrated modern discoveries; the one, the uses of the bile, boasted of by Sylvius de la Boe; and the other, the circulation of the blood. This last, however, is proved by Dr Friend, in his History of Physic, p. 229. to be falsely ascribed to this author.

The Roman empire beginning now to be oppressed by the barbarians, and sunk in gross superstition, learning of all kinds decreased; and when the empire was totally overwhelmed by those barbarous nations, every appearance of science was almost extinguished in Europe. The only remains of it were among the Arabians in Spain and in Asia.—The Saracens who came into Spain, destroyed at first all the Greek books which the Vandals had spared: but though their government was in a constant struggle and fluctuation during 800 years before they were driven out, they received a taste for learning from their countrymen of the east; several of their princes encouraged liberal studies; public schools were set up at Cordova, Toledo, and other towns, and translations of the Greeks into the Arabic were universally in the hands of their teachers.

Thus was the learning of the Grecians transferred to the Arabians. But though they had so good a foundation to build upon, this art was never improved while they were masters of the world: for they were satisfied with commenting upon Galen; and seem to have made no dissections of human bodies.

Abdollaliph, who was himself a teacher of anatomy, a man eminent in his time (at and before 1203) for his learning and curiosity; a great traveller, who had been bred at Bagdad, and had seen many of the great cities and principal places for study in the Saracen empire; who had a favourable opinion of original observation, in opposition to book-learning; who boldly corrected some of Galen's errors, and was persuaded that many more might be detected; this man, we say, never made or saw, or seemed to think of a human dissection. He discovered Galen's errors in the osteology, by going to burying-grounds, with his students and others, where he examined and demonstrated the bones; he earnestly recommended that method of study, in preference even to the reading of Galen, and thought that many farther improvements might be made; yet he seemed not to have an idea that a fresh subject might be dissected with that view.

Perhaps the Jewish tenets, which the Mahometans adopted, about uncleanliness and pollution, might prevent their handling dead bodies; or their opinion of what was supposed to pass between an angel and the dead person, might make them think disturbing the dead highly sacrilegious. Such, however, as Arabian learning was, for many ages together there was hardly any other in all the western countries of Europe. It was introduced by the establishment of the Saracens in Spain in 711, and kept its ground till the restoration of learning in the end of the 15th century. The state of anatomy in Europe, in the times of Arabian influence, may be seen by reading a very short system of anatomy drawn up by Mundinus, in the year 1315. It was extracted principally from what the Arabians had preserved of Galen's doctrine; and, rude as it is, in that age, it was judged to be so masterly a performance, that it was ordered by a public decree, that it should be read in all the schools of Italy; and it actually continued

tinued to be almoft the only book which was read upon the fubject for above 200 years. Cortefius gives him the credit of being the great reftorer of anatomy, and the firft who diffected human bodies among the moderns.

A general prejudice againft diffection, however, prevailed till the 16th century. The emperor Charles V. ordered a confultation to be held by the divines of Salamanca, in order to determine whether or not it was lawful in point of confcience to diffect a dead body. In Mufcovy, till very lately, both anatomy and the ufe of fkeletons were forbidden, the firft as inhuman, and the latter as fubfervient to witchcraft.

In the beginning of the 15th century, learning revided confiderably in Europe, and particularly phyfic, by means of copies of the Greek authors brought from the fack of Conftantinople; after which the number of anatomifts and anatomical books increafed to a prodigious degree.—The Europeans becoming thus poffeffed of the antient Greek fathers of medicine, were for a long time fo much occupied in correcting the copies they could obtain, ftudying the meaning, and commenting upon them, that they attempted nothing of their own, efpecially in anatomy.

And here the late Dr Hunter introduces into the annals of this art, a genius of the firft rate, Leonardo da Vinci, who had been formerly overlooked, becaufe he was of another profeffion, and becaufe he publifhed nothing upon the fubject. He is confidered by the Doctor as by far the beft anatomift and phyfiologift of his time; and was certainly the firft man we know of who introduced the practice of making anatomical drawings.

Vaffare, in his lives of the painters, fpeaks of Leonardo thus, after telling us that he had compofed a book of the anatomy of a horfe, for his own ftudy: "He afterwards applied himfelf with more diligence to the human anatomy; in which ftudy he reciprocally received and communicated affiftance to Marc. Antonio della Torre, an excellent philofopher, who then read lectures in Pavia, and wrote upon this fubject; and who was the firft, as I have heard, who began to illuftrate medicine from the doctrine of Galen, and to give true light to anatomy, which till that time had been involved in clouds of darknefs and ignorance. In this he availed himfelf exceedingly of the genius and labour of Leonardo, who made a book of ftudies, drawn with red chalk, and touched with a pen, with great diligence, of fuch fubjects as he had himfelf diffected; where he made all the bones, and to thofe he joined, in their order, all the nerves, and covered them with the mufcles. And concerning thofe, from part to part, he wrote remarks in letters of an ugly form, which are written by the left hand, backwards, and not to be underftood but by thofe who know the method of reading them; for they are not to be read without a looking-glafs. Of thefe papers of the human anatomy, there is a great part in the poffeffion of M. Francefco da Melzo, a Milanefe gentleman, who, in the time of Leonardo, was a moft beautiful boy, and much beloved by him, as he is now a beautiful and genteel old man, who reads thofe writings, and carefully preferves them, as precious relicts, together with the portrait of Leonardo, of happy memory. It appears impoffible that that divine fpirit fhould reafon fo well upon the arteries, and mufcles, and nerves, and veins; and with fuch diligence of every thing, &c. &c."

Thofe very drawings and the writings are happily found to be preferved in his Britannic Majefty's great collection of original drawings, where the Doctor was permitted to examine them; and his fentiments upon the occafion he thus expreffes: "I expected to fee little more than fuch defigns in anatomy, as might be ufeful to a painter in his own profeffion; but I faw, and indeed with aftonifhment, that Leonardo had been a general and a deep ftudent. When I confider what pains he has taken upon every part of the body, the fuperiority of his univerfal genius, his particular excellence in mechanics and hydraulics, and the attention with which fuch a man would examine and fee objects which he was to draw, I am fully perfuaded that Leonardo was the beft anatomift at that time in the world. We muft give the 15th century the credit of Leonardo's anatomical ftudies, as he was 55 years of age at the clofe of that century."

In the beginning of the 16th century, Achillinus and Benedictus, but particularly Berengarius and Maffa, followed out the improvement of anatomy in Italy, where they taught it, and publifhed upon the fubject. Thefe firft improvers made fome difcoveries from their own diffections: but it is not furprifing that they fhould have been diffident of themfelves, and have followed Galen almoft blindly, when his authority had been fo long eftablifhed, and when the enthufiafm for Greek authors was rifing to fuch a pitch.

Soon after this, we may fay about the year 1540, the great Vefalius appeared. He was ftudious, laborious, and ambitious. From Bruffels, the place of his birth, he went to Louvain, and thence to Paris, where anatomy was not yet making a confiderable figure, and then to Louvain to teach; from which place, very fortunately for his reputation, he was called to Italy, where he met with every opportunity that fuch a genius for anatomy could defire, that is, books, fubjects, and excellent draughtfmen. He was equally laborious in reading the ancients, and in diffecting bodies. And in making the comparifon, he could not but fee, that there was great room for improvement, and that many of Galen's defcriptions were erroneous. When he was but a young man, he publifhed a noble fyftem of anatomy, illuftrated with a great number of elegant figures.—In this work he found fo many occafions of correcting Galen, that his contemporaries, partial to antiquity, and jealous of his reputation, complained that he carried his turn for improvement and criticifms to licentioufnefs. The fpirit of oppofition and emulation was prefently roufed; and Sylvius in France, Columbus, Fallopius, and Euftachius in Italy, who were all in high anatomical reputation about the middle of this 16th century, endeavoured to defend Galen at the expence of Vefalius. In their difputes they made their appeals to the human body: and thus in a few years the art was greatly improved. And Vefalius being detected in the very fault which he condemned in Galen, to wit, defcribing from the diffections of brutes, and not of the human body, it expofed fo fully that blunder of the older anatomifts, that in fucceeding times there has been little reafon for fuch complaint.—Befides the above, he publifhed feveral other anatomical treatifes. He has been particularly ferviceable by impofingposing names on the muscles, most of which are retained to this day. Formerly they were distinguished by numbers, which were differently applied by almost every author.

In 1561, Gabriel Fallopius, professor of anatomy at Padua, published a treatise of anatomy under the title of *Observationes Anatomicæ*. This was designed as a supplement to Vesalius; many of whose descriptions he corrects, though he always makes mention of him in an honourable manner. Fallopius made many great discoveries, and his book is well worth the perusal of every anatomist.

In 1563, Bartholomæus Eustachius published his *Opuscula Anatomica* at Venice, which have ever since been justly admired for the exactness of the descriptions, and the discoveries contained in them. He published afterwards some other pieces, in which there is little of anatomy; but never published the great work he had promised, which was to be adorned with copperplates representing all the parts of the human body. These plates, after lying buried in an old cabinet for upwards of 150 years, were at last discovered and published in the year 1714, by Lancisi the pope's physician; who added a short explicatory text, because Eustachius's own writing could not be found.

From this time the study of anatomy gradually diffused itself over Europe; insomuch that for the last hundred years it has been daily improving by the labour of a number of professed anatomists almost in every country of Europe.

We may form a judgment about the state of anatomy even in Italy, in the beginning of the 17th century, from the information of Cortesius. He had been professor of anatomy at Bologna, and was then professor of medicine at Massana; where, though he had a great desire to improve himself in the art, and to finish a treatise which he had begun on practical anatomy, in 24 years he could twice only procure an opportunity of dissecting a human body, and then it was with difficulties and in hurry; whereas he had expected to have done so, he says, *once every year, according to the custom in the famous academies of Italy*.

In the very end of the 16th century, the great Harvey, as was the custom of the times, went to Italy to study medicine; for Italy was still the favourite seat of the arts: And in the very beginning of the 17th century, soon after Harvey's return to England, his master in anatomy, Fabricius ab Aquapendente, published an account of the valves in the veins, which he had discovered many years before, and no doubt taught in his lectures when Harvey attended him.

This discovery evidently affected the established doctrine of all ages, that the veins carried the blood from the liver to all parts of the body for nourishment. It set Harvey to work upon the use of the heart and vascular systems in animals; and in the course of some years he was so happy as to discover, and to prove beyond all possibility of doubt, the *circulation of the blood*. He taught his new doctrine in his lectures about the year 1616, and printed it in 1628.

It was by far the most important step that had been made in the knowledge of animal bodies in any age. It not only reflected useful lights upon what had been already found out in anatomy, but also pointed out the means of further investigation. And accordingly we see, that from Harvey to the present time, anatomy has been so much improved, that we may reasonably question if the ancients have been further outdone by the moderns in any other branch of knowledge. From one day to another there has been a constant succession of discoveries, relating either to the structure or functions of our body; and new anatomical processes, both of investigation and demonstration, have been daily invented. Many parts of the body, which were not known in Harvey's time, have since then been brought to light: and of those which were known, the internal composition and functions remained unexplained; and indeed must have remained unexplicable without the knowledge of the circulation.

Harvey's doctrine at first met with considerable opposition: but in the space of about 20 years it was so generally and so warmly embraced, that it was imagined every thing in physic would be explained. But time and experience have taught us, that we still are, and probably must long continue to be, very ignorant; and that in the study of the human body, and of its diseases, there will always be an extensive field for the exercise of sagacity.

After the discovery and knowledge of the circulation of the blood, the next question would naturally have been about the passage and route of the nutritious part of the food or chyle from the bowels to the blood-vessels: And, by good fortune, in a few years after Harvey had made his discovery, Asellius, an Italian physician found out the lacteals, or vessels which carry the chyle from the intestines; and printed his account of them, with coloured prints, in the year 1627, the very year before Harvey's book came out.

For a number of years after these two publications, the anatomists in all parts of Europe were daily opening living dogs, either to see the lacteals or to observe the phenomena of the circulation. In making an experiment of this kind, Pecquet in France was fortunate enough to discover the thoracic duct, or common trunk of all the lacteals, which conveys the chyle into the subclavian vein. He printed his discovery in the year 1651. And now the lacteals having been traced from the intestines to the thoracic duct, and that duct having been traced to its termination in a blood-vessel, the passage of the chyle was completely made out.

The same practice of opening living animals furnished occasions of discovering the lymphatic vessels. This good fortune fell to the lot of Rudbec first, a young Swedish anatomist; and then to Thomas Bartholine, a Danish anatomist, who was the first who appeared in print upon the lymphatics. His book came out in the year 1653, that is two years after that of Pecquet. And then it was very evident that they had been seen before by Dr Higmore and others, who had mistaken them for lacteals. But none of the anatomists of those times could make out the origin of the lymphatics, and none of the physiologists could give a satisfactory account of their use.

The circulation of the blood and the passage of the chyle having been satisfactorily traced out in full-grown animals, the anatomists were naturally led next to consider how these animal processes were carried on in the child while in the womb of the mother. Accordingly the male and female organs, the appearances and contents of the pregnant uterus, the incubated egg, and every phenomenon which could illustrate generation, became the favourite subject, for about 30 years, with the principal anatomists of Europe.

Thus it would appear to have been in theory: but Dr Hunter believes, that in fact, as Harvey's master Fabricius laid the foundation for the discovery of the circulation of the blood by teaching him the valves of the veins, and thereby inviting him to consider that subject; so Fabricius by his lectures, and by his elegant work *De formato fœtu, et de formatione ovi et pulli*, probably made that likewise a favourite subject with Dr Harvey. But whether he took up the subject of generation in consequence of his discovery of the circulation, or was led to it by his honoured master Fabricius, he spent a great deal of his time in the inquiry; and published his observations in a book *De generatione animalium*, in the year 1651, that is six years before his death.

In a few years after this, Swammerdam, Van Horn, Steno, and De Graaf, excited great attention to the subject of generation, by their supposed discovery that the females of viviparous animals have ovaria, that is, clusters of eggs in their loins, like oviparous animals; which, when impregnated by the male, are conveyed into the uterus: so that a child is produced from an egg as well as a chick; with this difference, that one is hatched within, and the other without, the body of the mother.

Malpighi, a great Italian genius, some time after, made considerable advances upon the subject of generation. He had the good fortune to be the first who used magnifying glasses with address in tracing the first appearances in the formation of animals. He likewise made many other observations and improvements in the *minutiæ* of anatomy by his microscopical labours, and by cultivating comparative anatomy.

This distinguished anatomist gave the first public specimen of his abilities, by printing a dissertation on the lungs *anno* 1661; a period so remarkable for the study of nature, that it would be injustice to pass it without particular notice.

At the same time flourished Laurentius Bellinus at Florence, and was the first who introduced mathematical reasoning in physic. In 1662, Simon Pauli published a treatise *De albandis ossibus*. He had long been admired for the white skeletons he prepared; and at last discovered his method, which was by exposing the bones all winter to the weather.

Johannes Swammerdam of Amsterdam also published some anatomical treatises; but was most remarkable for his knowledge of preserving the parts of bodies entire for many years, by injecting their vessels. He also published a treatise on respiration; wherein he mentioned his having figures of all the parts of the body as big as the life, cut in copper, which he designed to publish, with a complete system of anatomy. These, however, were never made public by Swammerdam; but in 1683, Gothrofridus Bidloo, professor of anatomy at Leyden, published a work entitled *Anatomia corporis humani*, where all the parts were delineated in very large plates almost as big as the life. Mr Cowper, an English surgeon, bought 300 copies of these figures; and in 1698, published them with an English text, quite different from Bidloo's Latin one; to which were added letters in Bidloo's figures, and some few figures of Mr Cowper's own. To this work Cowper's name was prefixed, without the least mention of Bidloo, except on purpose to confute him. Bidloo immediately published a very ill-natured pamphlet, called *Gulielmus Cowperus citatus coram tribunali*; appealing to the Royal Society, how far Cowper ought to be punished as a plagiary of the worst kind, and endeavouring to prove him an ignorant deceitful fellow. Cowper answered him in his own style, in a pamphlet called his *Vindiciæ*; endeavouring to prove, either that Bidloo did not understand his own tables, or that they were none of his. It was even alleged that those were the tables promised by Swammerdam, and which Bidloo had got from his widow. This, however, appears to have been only an invidious surmise, there being unquestionable evidence that they were really the performance of Bidloo.

Soon after, Isbrandus Diembroeck, professor of anatomy at Utrecht, began to appear as an author. His work contained very little original; but he was at great pains to collect from others whatever was valuable in their writings, and his system was the common standard among anatomical students for many years.

About the same time, Antonius Liewenhoeck of Delft, improved considerably on Malpighi's use of microscopes. These two authors took up anatomy where others had dropt it; and, by this new art, they brought a number of amazing things to light. They discovered the red globules of the blood; they were enabled to see the actual circulation of the blood in the transparent parts of living animals, and could measure the velocity of its motion; they discovered that the arteries and veins had no intermediate cells or spungy substance, as Harvey and all the preceding anatomists had supposed, but communicated one with the other by a continuation of the same tube.

Liewenhoeck was in great fame likewise for his discovery of the animalcula in the semen. Indeed there was scarcely a part of the body, solid or fluid, which escaped his examination; and he almost every where found, that what appeared to the naked eye to be rude undigested matter, was in reality a beautiful and regular compound.

After this period, Nuck added to our knowledge of the absorbent system already mentioned, by his injections of the lymphatic glands; Ruysch, by his description of the valves of the lymphatic vessels; and Dr Meckel, by his accurate account of the whole system, and by tracing those vessels in many parts where they had not before been described.

Besides these authors, Drs Hunter and Monro have called the attention of the public to this part of anatomy, in their controversy concerning the discovery of the office of the lymphatics.

When the lymphatic vessels were first seen and traced into the thoracic duct, it was natural for anatomists to suspect, that as the lacteals absorbed from the cavity of the intestines, the lymphatics, which are similar in figure and structure, might possibly do the same office with respect to other parts of the body: and accordingly, Dr Glisson, who wrote in 1654, supposes these vessels arose from cavities, and that their use was to absorb; and Frederic Hoffman has very explicitly laid down the doctrine of the lymphatic vessels being a system of absorbents. But anatomists in general have been of a contrary opinion; for, from experiments, particularly

ticularly such as were made by injections, they have been persuaded that the lymphatic vessels did not arise from cavities, and did not absorb, but were merely continuations from small arteries. The doctrine, therefore, that the lymphatics, like the lacteals, were absorbents, as had been suggested by Glisson and by Hoffman, has been revived by Dr Hunter and Dr Monro, who have controverted the experiments of their predecessors in anatomy, and have endeavoured to prove that the lymphatic vessels are not continued from arteries, but are absorbents.

To this doctrine, however, several objections have been started, particularly by Haller (Elem. Phys. l. 24. § 2, 3.); and it has been found, that before the doctrine of the lymphatics being a system of absorbents can be established, it must first be determined whether this system is to be found in other animals besides man and quadrupeds. Mr Hewson claims the merit of having proved the affirmative of this question, by discovering the lymphatic system in birds, fish, and amphibious animals. See *Phil. Transf.* vol. lviii. and lxix.— And latterly, Mr Cruikshank has traced the ramifications of that system in almost every part of the body; and from his dissections, figures have been made and lately published to the world. To Mr Sheldon also we are much indebted for his illustration of this system, which promises to give great satisfaction, but of which only a part has yet been published.

The gravid uterus is a subject likewise which has received considerable improvements, particularly relating to one very important discovery; viz. that the internal membrane of the uterus, which Dr Hunter has named *decidua*, constitutes the exterior part of the secundines or after-birth, and separates from the rest of the uterus every time that a woman either bears a child or suffers a miscarriage. This discovery includes another, to wit, that the placenta is partly made up of an excrescence or efflorescence from the uterus itself.

These discoveries are of the utmost consequence, both in the physiological question about the connection between the mother and child, and likewise in explaining the phenomena of births and abortions, as well as in regulating obstetrical practice.

The anatomists of this century have improved anatomy, and have made the study of it much more easy, by giving us more correct as well as more numerous figures. It is amazing to think of what has been done in that time. We have had four large folio books of figures of the bones, viz. Cheselden's, Albinus's, Sue's and Trew's. Of the muscles, we have had two large folios; one from Cowper, which is elegant; and one from Albinus, which, from the accuracy and labour of the work, we may suppose will never be outdone. Of the blood-vessels we have a large folio from Dr Haller. We have had one upon the nerves from Dr. Meckel, and another by Dr Monro junior. We have had Albinus's, Roederer's, Jenty's, and Hunter's works upon the pregnant uterus; Weitbrecht and Leber on the joints and fresh bones; Soemerring on the brain; Zin on the eye; Cotunnius, Mekel junior, &c. on the ear; Walterus on the nerves of the thorax and abdomen; Dr Monro on the bursæ mucosæ, &c.

It would be endless to mention the anatomical figures that have been published in this century, of particular and smaller parts of the body, by Morgagni, Ruysch, Valsalva, Sanctorini, Heister, Vater, Cant, Zimmerman, Walterus, and others.

Those elegant plates of the brain, however, just published by M. Vicq. d'Azyr, must not pass without notice, especially as they form part of an universal system of anatomy and physiology, both human and comparative, proposed to be executed in the same splendid style. Upon the brain alone 19 folio plates are employed; of which several are coloured. The figures are delineated with accuracy and clearness; but the colouring is rather beautiful than correct. Such parts of this work as may be published, cannot fail to be equally acceptable to the anatomist and the philosopher; but the entire design is apparently too extensive to be accomplished within the period of a single life. In Great Britain, also, a very great anatomical work is carrying on by Andrew Bell, F. S. A. S. engraver to his Royal Highness the Prince of Wales, with the approbation of Dr Monro, and under the inspection of his very ingenious assistant My Fyfe. It is to compose a complete illustration, both general and particular, of the human body, by a selection from the best plates of all the greatest anatomists, as well foreign as British, exhibiting the latest discoveries in the science, and accompanied with copious explanations. The whole number of plates mentioned in the Prospectus is 240, of which 152 are already done; all in royal folio.

To the foreign treatises already mentioned may be added those recently published by Sabbatier and Plenck on anatomy in general. In Great Britain, the writings of Keil, Douglas, Cheselden, the first Monro, Winslow, &c. are too well known to need description. The last of these used to be recommended as a standard for the students of anatomy: but it has of late given place to a more accurate and comprehensive system, in three volumes, published by Mr Elliot of Edinburgh, upon a plan approved of by Dr Monro, and executed by Mr Fyfe. Dr Simmons of London has also obliged the world with an excellent system of anatomy; and another work, under the title of "Elements of Anatomy and the Animal Oeconomy: in which the subjects are treated with uncommon elegance and perspicuity.

In the latter part of the last century, anatomy made two great steps, by the invention of injections, and the method of making what we commonly call *preparations*. These two modern arts have really been of infinite use to anatomy; and besides have introduced an elegance into our administrations, which in former times could not have been supposed to be possible. They arose in Holland under Swammerdam and Ruysch, and afterwards in England under Cowper, St André, and others, where they have been greatly improved.

The anatomists of former ages had no other knowledge of the blood-vessels, than what they were able to collect from laborious dissections, and from examining the smaller branches of them, upon some lucky occasion, when they were found more than commonly loaded with red blood. But filling the vascular system with a bright coloured wax, enables us to trace the large vessels with great ease, renders the smaller much more conspicuous, and makes thousands of the very minute ones visible, which from their delicacy, and the transparency of their natural contents, are otherwise imperceptible.

The modern art of corroding the fleshy parts with a menstruum, and of leaving the moulded wax entire, is so exceedingly useful, and at the same time so ornamental, that it does great honour to the ingenious inventor Dr. Nicholls.

The wax-work art of the moderns might deserve notice in any history of anatomy, if the masters in that way had not been so careless in their imitation. Many of the wax-figures are so tawdry with a show of unnatural colours, and so very incorrect in the circumstances of figure, situation, and the like, that though they strike a vulgar eye with admiration, they must appear ridiculous to an anatomist. But those figures which are cast in wax, plaster or lead, from the real subject, and which of late years have been frequently made, are, of course, very correct in all the principal parts, and may be considered as no insignificant acquisition to modern anatomy. The proper, or principal use of this art is, to preserve a very perfect likeness of such subjects as we but seldom can meet with, or cannot well preserve in a natural state; a subject in pregnancy for example.

The modern improved methods of preserving animal bodies, or parts of them, has been of the greatest service to anatomy; especially in saving the time and labour of the anatomist in the nicer dissections of the small parts of the body. For now, whatever he has prepared with care, he can preserve; and the object is ready to be seen at any time. And in the same manner he can preserve anatomical curiosities, or rarities of every kind; such as, parts that are uncommonly formed; parts that are diseased; the parts of the pregnant uterus and its contents. Large collections of such curiosities, which modern anatomists are striving almost every where to procure, are of infinite service to the art, especially in the hands of teachers. They give students clear ideas about many things which it is very essential to know, and yet which it is impossible that a teacher should be able to show otherwise, were he ever so well supplied with fresh subjects.

§ 2. *View of the Subject in General, and Plan of the following Treatise.*

The etymology of the word *anatomy*, as above given, implies simply *dissection*; but by this term something more is usually understood.

It is every day made use of to express a knowledge of the human body; and a person who is said to understand anatomy, is supposed to be conversant with the structure and arrangement of the different solid parts of the body.

It is commonly divided into *Anatomy*, properly so called; and *Comparative* Anatomy: the first of these is confined solely to the human body; the latter includes all animals, so far as a knowledge of their structure may tend to perfect our ideas of the human body. See Comparative *Anatomy*.

The term *anatomy* may also have another and more extensive signification: it may be employed to express not only a knowledge of the structure and disposition of the parts, but likewise of their œconomy and use. Considered in this light, it will seldom fail to excite the curiosity of people of taste, as a branch of philosophy: since, if it is pleasing to be acquainted with the structure of the body, it is certainly more so to discover all the springs which give life and motion to the machine, and to observe the admirable mechanism by which so many different functions are executed.

Astronomy and anatomy, as Dr Hunter, after Fontenelle, observes, are the studies which present us with the most striking view of the two greatest attributes of the Supreme Being. The first of these fills the mind with the idea of his immensity, in the largeness, distances, and number of the heavenly bodies; the last, astonishes with his intelligence and art in the variety and delicacy of animal mechanism.

The human body has been commonly enough known by the name of *microcosmus*, or the little world; as if it did not differ so much from the universal system of nature in the symmetry and number of its parts as in their size.

Galen's excellent treatise *De usu partium*, was composed as a prose hymn to the Creator; and abounds with as irresistible proofs of a supreme Cause and governing Providence, as we find in modern physicotheology. And Cicero dwells more on the structure and œconomy of animals than on all the productions of nature besides, when he wants to prove the existence of the gods from the order and beauty of the universe. He there takes a survey of the body of man in a most elegant synopsis of anatomy, and concludes thus: "Quibus rebus expositus, satis docuisse videor, hominis natura, quanto omnes anteiret animantes. Ex quo debet intelligi, nec figuram situmque membrorum, nec ingenii mentisque vim talem effici potuisse fortuna."

The satisfaction of mind which arises from the study of anatomy, and the influence which it must naturally have upon our minds as philosophers, cannot be better conveyed than by the following passage from the same author: "Quæ contuens animus, accepit ab his cognitionem deorem, ex qua oritur pietas: cui conjuncta justitia est, reliquæque virtutes: ex quibus vita beata exsistit, par et similes deorum, nulla alia re nisi immortalitate, quæ nihil ad bene vivendum pertinet, cedens cœlestibus."

It would be endless to quote the animated passages of this sort which are to be found in the physicians, philosophers, and theologists, who have considered the structure and functions of animals with a view towards the Creator. It is a view which must strike one with a most awful conviction. Who can know and consider the thousand evident proofs of the astonishing art of the Creator, in forming and sustaining an animal body such as ours, without feeling the most pleasant enthusiasm? Can we seriously reflect upon this awful subject, without being almost lost in adoration? without longing for another life after this, in which we may be gratified with the highest enjoyment, which our faculties and nature seem capable of, the seeing and comprehending the whole plan of the Creator, in forming the universe and in directing all its operations?

But the more immediate purposes of anatomy concern those who are to be the guardians of health, as this study is necessary to lay a foundation for all the branches of medicine. The more we know of our fabric, the more reason we have to believe, that if our senses were more acute, and our judgment more enlarged, we should be able to trace many springs of life which are now hidden from us: by the same sagacity we should discover the true causes and nature of diseases; and thereby be enabled to restore the health of many, who are now, from our more confined knowledge, said to labour under incurable disorders. By such an intimate acquaintance with the œconomy of our bodies, we should discover even the seeds of diseases, and destroy them before they had taken root in the constitution.

That anatomy is the very basis of surgery every body allows. It is dissection alone that can teach us, where we may cut the living body with freedom and dispatch; and where we may venture with great circumspection and delicacy; and where we must not, upon any account, attempt it. This informs the *head*, gives dexterity to the *hand*, and familiarizes the *heart* with a sort of necessary inhumanity, the use of cutting-instruments upon our fellow-creatures.

Besides the knowledge of our body, through all the variety of its *structure* and *operations* in a *sound* state, it is by anatomy only that we can arrive at the knowledge of the true nature of most of the diseases which afflict humanity. The symptoms of many disorders are often equivocal; and diseases themselves are thence frequently mistaken, even by sensible, experienced, and attentive physicians. But by anatomical examination after death, we can with certainty find out the mistake, and learn to avoid it in any similar case.

This use of anatomy has been so generally adopted by the moderns, that the cases already published are almost innumerable: Mangetus, Morgagni, indeed many of the best modern writings in physic, are full of them. And if we look among the physicians of the best character, and observe those who have the *art* itself, rather than the *craft* of the profession at heart; we shall find them constantly taking pains to procure leave to examine the bodies of their patients after death.

After having considered the rise and progress of anatomy; the various discoveries that have been made in it, from time to time; the great number of diligent observers who have applied themselves to this art; and the importance of the study, not only for the prevention and cure of diseases, but in furnishing the liveliest proofs of divine wisdom; the following questions seem naturally to arise: For what purpose is there such a variety of parts in the human body? Why such a complication of nice and tender machinery? Why was there not rather a more simple, less delicate, and less expensive frame (A)?

In order to acquire a satisfactory general idea of this subject, and find a solution of all such questions, let us, in our imaginations, *make* a man: in other words let us suppose that the *mind*, or immaterial part, is to be placed in a corporeal fabric, in order to hold a correspondence with other material beings by the intervention of the body; and then consider, *a priori*, what will be wanted for her accommodation. In this inquiry, we shall plainly see the necessity or advantage, and therefore the final cause, of most of the parts which we actually find in the human body. And if we consider that, in order to answer some of the requisites, human wit and invention would be very insufficient: we need not be surprised if we meet with some parts of the body whose use we cannot yet perceive, and with some operations and functions which we cannot explain. We can see that the whole bears the most striking characters of excelling wisdom and ingenuity: but the imperfect senses and capacity of *man* cannot pretend to reach every part of a machine, which nothing less than the intelligence and power of the *Supreme Being* could contrive and execute.

First, then, the *mind*, the thinking, immaterial agent, must be provided with a place of immediate residence, which shall have all the requisites for the union of spirit and body; accordingly she is provided with the *brain*, where she dwells as governor and superintendant of the whole fabric.

In the next place, as she is to hold a correspondence with all the material beings around her, she must be supplied with organs fitted to receive the different kinds of impressions which they will make. In fact, therefore, we see that she is provided with the organs of sense, as we call them: the eye is adapted to light; the ear to sound; the nose to smell; the mouth to taste; and the skin to touch.

Further: She must be furnished with organs of communication between herself in the brain and those organs of sense, to give her information of all the impressions that are made upon them: and she must have organs between herself in the brain and every other part of the body, fitted to convey her commands and influence over the whole. For these purposes the nerves are actually given. They are chords, which rise from the brain, the immediate residence of the mind, and disperse themselves in branches through all parts of the body. They convey all the different kinds of sensations to the mind, in the brain; and likewise carry out from thence all her commands or influence to the other parts of the body. They are intended to be occasional monitors against all such impressions as might endanger the well-being of the whole, or of any particular part; which vindicates the Creator of all things, in having actually subjected us to those many disagreeable and painful sensations which we are exposed to from a thousand accidents in life.

Moreover, the mind, in this corporeal system, must be endued with the power of moving from place to place, that she may have intercourse with a variety of objects; that she may fly from such as are disagreeable, dangerous or hurtful, and pursue such as are pleasant or useful to her. And accordingly she is furnished with limbs, and with muscles and tendons, the instruments of motion, which are found in every part of the fabric where motion is necessary.

But to support, to give firmness and shape to the fabric; to keep the softer parts in their proper places; to give fixed points for, and the proper direction to its motions, as well as to protect some of the more important and tender organs from external injuries; there

(A) The following beautiful representation is taken from the late Dr Hunter's *Introductory Lecture in Anatomy*.

there must be some firm prop-work interwoven thro' the whole. And, in fact, for such purposes the bones are given.

The prop-work must not be made into one rigid fabric, for that would prevent motion. Therefore there are a number of bones.

These pieces must all be firmly bound together, to prevent their dislocation. And this end is perfectly well answered by the ligaments.

The extremities of these bony pieces, where they move and rub upon one another, must have smooth and slippery surfaces for easy motion. This is most happily provided far, by the cartilages and mucus of the joints.

The interstices of all those parts must be filled up with some soft and ductile matter, which shall keep them in their places, unite them, and at the same time allow them to move a little upon one another. And these purposes are answered by the cellular membrane or adipose substance.

There must be an outward covering over the whole apparatus, both to give it compactness and to defend it from a thousand injuries: which, in fact, are the very purposes of the skin and other integuments.

Lastly, the mind being formed for society and intercourse with beings of her own kind, she must be endued with powers of expressing and communicating her thoughts by some sensible marks or signs; which shall be both easy to herself, and admit of great variety; and accordingly she is provided with the organs and faculty of speech, by which she can throw out signs with amazing facility, and vary them without end.

Thus we have built up an animal body which would seem to be pretty complete; but as it is the nature of matter to be altered and worked upon by matter; so in a very little time such a living creature must be destroyed, if there is no provision for repairing the injuries which she must commit upon herself, and those which she must be exposed to from without. Therefore a treasure of blood is actually provided in the heart and vascular system, full of nutritious and healing particles, fluid enough to penetrate into the minutest parts of the animal; impelled by the heart, and conveyed by the arteries, it washes every part, builds up what was broken down, and sweeps away the old and useless materials. Hence we see the necessity or advantage of the heart and arterial system.

What more there was of this blood than enough to repair the present damages of the machine, must not be lost, but should be returned again to the heart; and for this purpose the venous system is actually provided. These requisites in the animal explain, *a priori*, the circulation of the blood.

The old materials which were become useless, and are swept off by the current of blood, must be separated and thrown out of the system. Therefore glands, the organs of Secretion, are given for straining whatever is redundant, vapid, or noxious, from the mass of blood; and when strained, they are thrown out by emunctories, called organs or Excretion.

But now, as the machine must be constantly wearing, the reparation must be carried on without intermission, and the strainers must always be employed. Therefore there is actually a perpetual circulation of the blood, and the secretions are always going on.

Even all this provision, however, would not be sufficient; for that store of blood would soon be consumed, and the fabric would break down, if there were not a provision made for fresh supplies. These we observe, in fact, are profusely scattered round her in the animal and vegetable kingdoms; and she is furnished with hands, the fittest instruments that could have been contrived, for gathering them, and for preparing them in a variety of ways for the mouth.

But these supplies, which we call food, must be considerably changed; they must be converted into blood. Therefore she is provided with teeth for cutting and bruising the food, and with a stomach for melting it down: In short, with all the organs subservient to digestion.—The finer parts of the aliments only can be useful in the constitution: these must be taken up and conveyed into the blood, and the dregs must be thrown off. With this view the intestinal canal is actually given. It separates the nutritious part, which we call *chyle*, to be conveyed into the blood by the system of absorbent vessels; and the fæces pass downwards, to be conducted out of the body.

Now we have got our animal not only furnished with what is wanted for its immediate existence, but also with the powers of protracting that existence to an infinite length of time. But its duration, we may presume, must necessarily be limited: for as it is nourished, grows, and is raised up to its full strength and utmost perfection; so it must, in time, in common with all material beings, begin to decay, and then hurry on to final ruin. Hence we see the necessity of a scheme for renovation. Accordingly wise Providence, to perpetuate, as well as preserve his work, besides giving a strong appetite for life and self-preservation, has made animals male and female, and given them such organs and passions as will secure the propagation of the species to the end of time.

Thus we see, that by the very imperfect survey which human reason is able to take of this subject, the animal man must necessarily be complex in his corporeal system, and in its operations.

He must have one great and general system, the vascular, branching through the whole for circulation: Another, the nervous, with its appendages the organs of sense, for every kind of feeling: And a third, for the union and connection of all those parts.

Besides these primary and general systems, he requires others which may be more local or confined: One for strength, support, and protection; the bony compages: Another for the requisite motions of the parts among themselves, as well as from moving from place to place; the muscular part of the body: Another to prepare nourishment for the daily recruit of the body; the digestive organs: And one for propagating the species; the organs of generation.

And in taking this general survey of what would appear, *a priori*, to be necessary for adapting an animal to the situations of life, we observe, with great satisfaction, that man is accordingly made of such systems, and for such purposes. He has them all; and he has nothing more, except the organs of respiration. Breathing it seemed difficult to account for *a priori*: we only knew it to be in fact essentially necessary to life. Notwithstanding this, when we saw all the other parts of the body, and their functions, so well accounted for, and so wisely adapted to their several purposes, there could be no doubt that respiration was so likewise: And accordingly, the discoveries of Dr Priestley have lately thrown light upon this function also, as will be shown in its proper place.

Of all the different systems in the human body, the use and necessity are not more apparent, than the wisdom and contrivance which has been exerted in putting them all into the most compact and convenient form: in disposing them so, that they shall mutually receive, and give helps to one another; and that all, or many of the parts, shall not only answer their principal end or purpose, but operate successfully and usefully in a variety of secondary ways.

If we consider the whole animal machine in this light, and compare it with any machine in which human art has exerted its utmost; suppose the best constructed ship that ever was built, we shall be convinced beyond the possibility of doubt, that there are intelligence and power far surpassing what humanity can boast of.

One superiority in the natural machine is peculiarly striking.—In machines of human contrivance or art, there is no internal power, no principle in the machine itself, by which it can alter and accommodate itself to any injury which it may suffer, or make up any injury which admits of repair. But in the natural machine, the animal body, this is most wonderfully provided for by internal powers in the machine itself; many of which are not more certain and obvious in their effects, than they are above all human comprehension as to the manner and means of their operation. Thus, a wound heals up of itself; a broken bone is made firm again by a callus; a dead part is separated and thrown off; noxious juices are driven out by some of the emunctories; a redundancy is removed by some spontaneous bleeding; a bleeding naturally stops of itself; and a great loss of blood, from any cause, is in some measure compensated, by a contracting power in the vascular system, which accommodates the capacity of the vessels to the quantity contained. The stomach gives information when the supplies have been expended; represents, with great exactness, the quantity and the quality of what is wanted in the present state of the machine; and in proportion as she meets with neglect, rises in her demand, urges her petition in a louder tone, and with more forcible arguments. For its protection, an animal body resists heat and cold in a very wonderful manner, and preserves an equal temperature in a burning and in a freezing atmosphere.

A farther excellence or superiority in the natural machine, if possible, still more astonishing, more beyond all human comprehension, than what we have been speaking of, is the following. Besides those internal powers of self-preservation in each individual, when two of them co-operate, or act in concert, they are endued with powers of making other animals or machines like themselves, which again are possessed of the same powers of producing others, and so of multiplying the species without end.

These are powers which mock all human invention or imitation. They are characteristics of the divine Architect.

Having premised this general account of the subject, we shall next consider the method to be observed in treating it.

The study of the *human* body, as already noticed, is commonly divided into two parts. The first, which is called *Anatomy*, relates to the matter and structure of its parts; the second, *Physiology* and *Animal œconomy*, relates to the principles and laws of its internal operations and functions.

As the body is a compound of solids and fluids, *Anatomy* is divided into,

1. The Anatomy of the solids, and
2. The Anatomy of the fluids.

I. The Solids, by which we mean all parts of our body which are not fluid, are generally divided into two classes, viz.

1. The hard solids or bones. This part of anatomy is called *Osteology*; which signifies the doctrine of the bones.

2. The softer solids; which part is called *Sarcology*, viz. the doctrine of flesh.

This division of the solids, we may observe, has probably taken its origin from the vulgar observation, that the body is made of bone and flesh. And as there are many different kinds of what are called soft or fleshy parts, Sarcology is subdivided into,

(1.) *Angeiology*, or the doctrine of vessels; by which is commonly understood *blood-vessels*:
(2.) *Adenology*, of glands:
(3.) *Neurology*, of nerves:
(4.) *Myology*, of muscles: and,
(5.) *Splanchnology*, of the viscera or bowels. There is, besides, that part which treats of the organs of sense and of the integuments.

This division of the solids has been here mentioned, rather for the sake of explaining so many words, which are constantly used by anatomists, than for its importance or accuracy. For besides many other objections that might be urged, there are in the body three species of solids, viz. gristle or cartilage, hair, and nails; which are of an intermediate nature between bone and flesh; and therefore cannot so properly be brought into the osteology or the sarcology. The cartilages were classed with the bones; because the greatest number of them are appendages to bones: and for the like reason the hair and the nails were classed with the integuments.

II. The fluids of the human body may be divided into *three* kinds, which Dr Hunter calls the *crude*, the *general* or *perfect*, and the *local* or *secreted fluid*.

1. By the *crude* fluid is meant the chyle, and whatever is absorbed at the surfaces of the body; in other words, what is recently taken into the body, and is not yet mixed with or converted into blood.

2. The *general* or *perfect* fluid is the blood itself; to wit, what is contained in the heart, arteries, and veins, and is going on in the round of the circulation.

3. The *local* or *secreted*, are those fluids peculiar to particular parts of the body, which are strained off from the blood, and yet are very different in their properties from the blood. They are commonly called *secretions*; and some are useful, others excrementitious.

In treating of the *Physiology*, it is very difficult to say what plan should be followed; for every method which has been yet proposed, is attended with manifest inconvenience.

convenience. The powers and operations of the machine have such a dependence upon one another, such connections and reciprocal influence, that they cannot well be understood or explained separately. In this sense our body may be compared to a circular chain of powers, in which nothing is first or last, nothing solitary or independent; so that wherever we begin, we find that there is something preceding which we ought to have known. If we begin with the brain and the nerves, for example, we shall find that these cannot exist, even in idea, without the heart: if we set out with the heart and vascular system, we shall presently be sensible, that the brain and nerves must be supposed: or, should we take up the mouth, and follow the course of the aliment, we should see that the very first organ which presented itself, supposed the existence of both the heart and brain: Wherefore we shall incorporate the Physiology with the Anatomy, by attempting to explain the functions after we have demonstrated the organs.

PART I. OSTEOLOGY.

WE begin with the bones, which may be considered as the great support of the body, tending to give it shape and firmness.—But before we enter into the detail of each particular bone, it will be necessary to describe their composition and connections, and to explain the nature of the different parts which have an immediate relation to them; as the cartilages, ligaments, periosteum, marrow, and synovial glands.

SECT. I. *Of the Bones in general, with their Appendages*, &c.

1 Of the composition of the bones. THE bones are of a firm and hard (B) substance, of a white colour, and perfectly insensible. They are the most compact and solid parts of the body, and serve for the attachment and support of all the other parts.

Three different substances are usually distinguished in them; their exterior or bony part, properly so called; their spongy cells; and their reticular substance. The first of these is formed of many laminæ or plates, composing a firm hard substance—The spongy or cellular part is so called on account of its resemblance to a sponge, from the little cells which compose it. This substance forms almost the whole of the extremities of cylindrical bones. The reticular part is composed of fibres, which cross each other in different directions. This net-work forms the internal surface of those bones which have cavities.

The flat bones, as those of the head, are composed only of the laminæ and the cellular substance. This last is usually found in the middle of the bone dividing it into two plates, and is there called *diploë*.

Gagliardi, who pretended to have discovered an infinite number of claviculi (c), or bony processes, which he describes as traversing the laminæ to unite them together, has endeavoured to support this pretended discovery by the analogy of bones to the bark of trees, in which certain woody nails have been remarked; but this opinion seems to be altogether fanciful.

Some writers have supposed, that the bones are formed by layers of the periosteum, which gradually ossify, in the same manner as the timber is formed in trees by the hardening of the white substance that is found between the inner bark and the wood. M. Duhamel, who has adopted this opinion, fed different animals with madder and their ordinary food alternately during a certain time; and he asserts, that in dissecting their bones, he constantly observed distinct layers of red and white, which corresponded with the length of time they had lived on madder or their usual aliment. But it has since been proved by Detleff, that M. Duhamel's experiments were inaccurate, and that neither the periosteum nor the cartilages are tinged by the use of the madder, which is known to affect the bones only.

We usually consider in a bone, its body and its extremities. The ancients gave the name of diaphysis to the body or middle part, and divided the extremities into apophysis and epiphysis. An apophysis, or process, as it is more commonly called, is an eminence continued from the body of the bone, whereas an epiphysis is at first a sort of an apendage to the bone, by means of an intermediate cartilage. Many epiphyses, which appear as distinct bones in the fœtus, afterwards become apophyses; for they are at length so completely united to the body of the bone as not to be distinguishable from it in the adult state. It is not unusual, however, at the age of 18 and even 20 years, to find the extremities of bones still in the state of epiphysis.

The names given to the processes of bones are expressive of their shape, size, or use; thus if a process is large and of a spherical form, it is called *caput*, or *head*; if the head is flatted, it is termed *condyle*. Some processes, from their resemblance to a stiletto, a breast, or the beak of a crow, are called *styliod*, *mastoid*, or *coracoid*: others are styled *ridges* or *spines*. The two processes of the os femoris derive their name of *trochanters* from their use.

A bone has its cavities as well as processes. These cavities either extend quite through its substance, or appear only as depressions. The former are called *foramina* or *holes*, and these foramina are sometimes termed *canals* or *conduits*, according to their form and extent. Of the depressions, some are useful in articulation. These are called *cotyloid* when they are deep, as is the case with the os innominatum, where it receives the head of the os femoris; or *glenoid* when they are superficial, as in the scapula, where it receives the os humeri. Of the depressions that are not designed for

(B) Mr Scheele has lately discovered that bones contain the phosphoric acid united with calcareous earth; and that to this combination they owe their firmness.

(c) In his *Anat. Ossium nov. invent. illustrat.* he describes four kinds of these claviculi or nails, viz. the perpendicular, oblique, headed, and crooked for articulation, those which have small apertures are called *sinuses*; others that are large, and not equally surrounded by high brims, are styled *fossæ*; such as are long and narrow, *furrows*; or if broad and superficial without brims, *sinuosities*. Some are called *digital impressions*, from their resemblance to the traces of a finger on soft bodies.

2
Connection of the bones.

We shall abridge this article, which is exceedingly diffuse in the generality of anatomical books, and will endeavour to describe it with all the clearness it will allow.

The bones composing the skeleton are so constructed, that the end of every bone is perfectly adapted to the extremity of that with which it is connected, and this connection forms what is called their *articulation*.

Articulation is divided into *diarthrosis*, *synathrosis*, and *amphiarthrosis*, or moveable, immoveable, and mixed articulation. Each of the two first has its subdivisions. Thus the *Diarthrosis*, or moveable articulation, includes 1. The enarthrosis, as it is called, when a large head is admitted into a deep cavity, as in the articulation of the os femoris with the os innominatum. 2. Arthrodia, when a round head is articulated with a superficial cavity, as in the case of the os humeri and scapula. 3. Ginglimus, or hinge-like articulation, as in the connection of the thigh bone with the tibia. The enarthrosis and arthrodia allow of motion to all sides; the ginglimus only of flexion and extension.

The *synarthrosis*, or immoveable articulation, includes, 1. The suture, when the two bones are indented into each other, as is the case with the parietal bones. 2. Gomphosis, when one bone is fixed into another, in the manner the teeth are placed in their sockets.

The term *amphiarthrosis* is applied to those articulations which partake both of the synarthrosis and diarthrosis, as is the case with the bones of the vertebræ, which are capable of motion in a certain degree, although they are firmly connected together by intermediate cartilages.

What is called *symphysis* is the union of two bones into one; as in the lower jaw, for instance, which in the fœtus consists of two distinct bones, but becomes one in a more advanced age, by the ossification of the uniting cartilage.

When bones are thus joined by the means of cartilages, the union is styled *synchondrosis*; when by ligaments, *syneurosis*.

3
Of the Cartilages.

Cartilages are white, solid, smooth, and elastic substances, between the hardness of bones and ligaments, and seemingly of a fibrous texture. We are not able to trace any vessels into their substance by injection, nor are they ever found tinged in animals that have been fed with madder.

They may be distinguished into, 1st, Those which are connected with the bones; and, 2dly, Those which belong to other parts of the body. The first serve either to cover the ends and cavities of bones intended for motion, as in the articulations, where by their smoothness they facilitate motions, which the bones alone could not execute with so much freedom; or they serve to unite bones together, as in the smphysis pubis, or to lengthen them, as in the ribs.

Many of them ossifying as we advance in life, their number is less in the adult than in the fœtus, and of course there are fewer bones in the old than in the young subject.

Of the second class of cartilages, or those belonging to the soft parts, we have instances in the larynx, where we find them useful in the formation of the voice, and for the attachment of muscles.

4
Of the Periosteum.

The periosteum is a fine membrane of a compact cellular texture, reflected from one joint to another, and serving as a common covering to the bones. It has sanguiferous and lymphatic vessels, and is supplied with nerves from the neighbouring parts. It adheres very firmly to their surface, and by its smoothness facilitates the motion of muscles. It likewise supports the vessels that go to be distributed through the substance of the bones, and may serve to strengthen the articulations. At the extremities of bones, where it is found covering a cartilage, it has by some been improperly considered as a distinct membrane, and named *perichondrium*. This, in its use and structure, resembles the periosteum. Where it covers the bones of the skull, it has gotten the name of *pericranium*.

The periosteum is not a production of the dura mater, as the ancients, and after them Havers, imagined; nor are the bones formed by the ossification of this membrane, at least when it is in a sound state, as some late writers have supposed.

The periosteum is deficient in the teeth above the sockets, and in those parts of bones to which ligaments or tendons are attached.

5
Of the Marrow.

The marrow is a fat oily substance, filling the cavities of bones. In the great cavities of long bones it is of a much firmer consistence than in the cells of their spongy part. In the former it inclines somewhat to a yellowish tinge, and is of the consistence of fat; in the latter it is more fluid, and of a red colour. This difference in colour and consistence is owing to accidental causes: both kinds are of the same nature, and may both be described under the common name of marrow, though some writers give the name only to the fat-like substance, and call the other the medullary juice.

The marrow is contained in a very fine and transparent membrane, which is supplied with a great number of blood vessels, chiefly from the periosteum. This membrana medullaris adheres to the inner surface of the bones, and furnishes an infinite number of minute bags or vesicles for inclosing the marrow, which is likewise supported in the cavities of the bones by the long filaments of their reticular substance.

Besides the vessels from the periosteum, the membrana medullaris is furnished with others, which in the long bones may be seen passing in near the extremities of the bone, and sending off numerous branches that ramify through all the vesicles of this membrane.

The bones, and the cells containing the marrow, are likewise furnished with lymphatics. By their means the marrow, like the fat, may be taken up in a greater quantity than it is secreted; and hence it is that so little is found in the bones of those who die of lingering diseases.

It is still a matter of controversy, Whether the marrow is sensible or not? We are certainly not able to trace any nerves to it; and from this circumstance, and its analogy to fat, Haller has ventured to consider it as insensible. On the other hand, Duverney asserts, that

that an injury done to this substance in a living animal was attended with great pain. In this dispute physiologists do not seem to have sufficiently discriminated between the marrow itself and the membranous cells in which it is contained. The former, like the fat, being nothing more than a secreted, and of course an inorganized, matter, may with propriety be ranked among the insensible parts, as much as inspissated mucus or any other secreted matter in the body; whereas the membrana medullaris being vascular, though it possesses but an obscure degree of feeling in a sound state, is not perfectly insensible.

The marrow was formerly supposed to be intended for the nourishment and renewal of the bones; but this doctrine is now pretty generally and deservedly exploded. It seems probable that the marrow is to the bones what fat is to the soft parts. They both serve for some important purposes in the animal œconomy; but their particular use has never yet been clearly ascertained. The marrow, from the transudation of the oil through the bones of a skeleton, is supposed to diminish their brittleness; and Havers, who has written professedly on the bones, describes the canals by which the marrow is conveyed through every part of their substance, and divides them into longitudinal and transverse ones. He speaks of the first as extending through the whole length of the bone; and of the latter, as the passage by which the longitudinal ones communicate with each other. The similarity of these to the large cancelli in burnt bones, and the transudation of the oil through the bones of the skeleton, seems to prove that some such passages do actually exist.

6
Synovial glands.

The synovial glands are small bodies (D), supposed to be of a glandular structure, and exceedingly vascular, secreting a fluid of a clear mucilaginous nature, which serves to lubricate the joints. They are placed in small cavities in the articulations, so as to be capable of being gently compressed by the motion of the joint, which expresses their juice in proportion to the degree of friction. When the synovia is wanting, or is of too thick a consistence, the joint becomes stiff and incapable of flexion or extension. This is what is termed *anchylosis*.

7
Of the ligaments.

Ligaments are white, glistening, inelastic bands, of a compact substance, more or less broad or thick, and serving to connect the bones together. They are distinguished by different names adapted to their different forms and uses. Those of the joints are called either round or bursal. The round ligaments are white, tendinous, and inelastic. They are strong and flexible, and are found only in the joint of the knee, and in the articulation of the os femoris with the os innominatum. The bursal, or capsular ligaments, surround the whole joint like a purse, and are to be found in the articulations which allow motion every way, as in the articulation of the arm with the scapula.

8
Of the Bursæ mucosæ.

Of those sacs called *Bursæ mucosæ*, a few were known to former anatomists, but by much the greater number have been since discovered by Dr Monro (E), who observes, that they are to be met with in the extremities of the body only; that many of them are placed entirely on the inner sides of the tendons, between these and the bones. Many others cover not only the inner, but the outer sides of the tendons, or are interposed between the tendons and external parts, as well as between those and the bones.

Some are situated between the tendons and external parts only or chiefly, some between contiguous tendons, or between the tendons or the ligaments and the joints. A few such sacs are observed where the processes of bones play upon the ligaments, or where one bone plays upon another. Where two or more tendons are contiguous, and afterwards separate from each other, we generally find a common bursa divided into branches, with which it communicates; and a few bursæ of contiguous tendons communicate with each other.—Some, in healthy children communicate with the cavities of the joints; and in many old people he has seen such communications formed by use or worn by friction, independent of disease.

Their proper membrane is thin and transparent, but very dense, and capable of confining air or any other fluid. It is joined to the neighbouring parts by the common cellular substance. Between the bursa and the hard substance of bone, a thin layer of cartilage or of tough membrane is very generally interposed. To the cellular substance on the outside of the bursa, the adipose substance is connected; except where the bursa covers a tendon, cartilage, or bone, much exposed to pressure or friction.

In several places a mass of fat, covered with the continuation of the membrane of the bursa, projects into its cavity. The edges of this are divided into fringes.

The inner side of the membrane is smooth, and is extremely slippery from the liquor secreted in it.

9
Their structure compared with that of the capsular ligaments of the joints.

The structure of the bursæ bears a strong resemblance to the capsular ligaments of the joints. 1. The inner layer of the ligament, like that of the bursæ, is thin and dense. 2. It is connected to the external ligaments by the common cellular substance. 3. Between it and the bones, layers of cartilage, or the articular cartilages, are interposed. 4. At the sides of the joints, where it is not subjected to violent pressure and friction, the adipose substance is connected with the cellular membrane. 5. Within the cavities of the joints we observe masses of fat projecting, covered with similar blood-vessels, and with similar fimbriæ hanging from their edges. 6. In the knee the upper part of such a mass of fat forms what has been called the *mucilaginous gland of the joint*, and the under part projects into the bursa behind the ligament which ties the patella to the tibia. 7. The liquor which lubricates the bursæ has the same colour, consistence, and properties as that of the joints, and both are affected in the same manner by heat, mineral acids, and ardent spirits. 8. In some places the bursæ constantly communicate with the cavities of the joints, in others they generally do so; from which we may infer a sameness of structure.

When we examine the fimbriæ common to the fatty bodies of the joints and bursæ, and which have been supposed to be the ducts of glands lodged within the masses

(D) It is now much doubted, however, whether the appearances in the joints, which are usually called *glands*, are any thing more than assemblages of fat.

(E) See *Description of the Bursæ Mucosæ*, &c.

masses of fat, we are not able to discover any glandular appearance within them. And although we observe many vessels dispersed upon the membranes of the fatty bodies and fimbriæ; and that we cannot doubt that these fimbriæ consist of ducts which contain a lubricating liquor, and can even press such a liquor from them; yet their cavities and orifices are so minute, that they are not discoverable even by the assistance of magnifying-glasses. These fimbriæ appear, therefore, to be ducts like those of the urethra, which prepare a mucilaginous liquor without the assistance of any knotty or glandular organ.

Upon the whole, the synovia seems to be furnished by invisible exhalent arteries by the ducts of the fimbriæ, and by oil exuding from the adipose follicles by passages not yet discovered.

10 Of the Skeleton.

The word *skeleton*, which by its etymology implies simply a dry preparation, is usually applied to an assemblage of all the bones of an animal united together in their natural order. It is said to be a natural skeleton, when the bones are connected together by their own proper ligaments; and an artificial one, when they are joined by any other substance, as wire, &c.

The skeleton is generally divided into the head, trunk and extremities. The first division includes, the bones of the cranium and face. The bones of the trunk are the spine, ribs, sternum, and bones of the pelvis.

The upper extremity on each side consists of the two bones of the shoulder, viz. the scapula and clavicle; the bone of the arm, or os humeri; the bones of the fore-arm, and those of the hand.

The lower extremity on each side of the trunk consists of the thigh-bone and the bones of the leg and foot.

Sect. II. *Of the Bones of the Head.*

The head is of a roundish figure, and somewhat oval (F). Its greatest diameter is from the forehead to the occiput; its upper part is called *vertex*, or crown of the head; its anterior or fore-part the face; and the upper part of this *sinciput*, or forehead; its sides the temples; its posterior, or hind-part, the *occiput*; and its inferior part the *basis*.

The bones of the head may be divided into those of the cranium and face.

§ 1. *Bones of the Cranium and Face.*

There are eight bones of the cranium, viz. the coronal bone, or os frontis; the two parietal bones, or ossa bregmatis; the os occipitis; the two temporal bones; the sphenoid bone; and the os ethmoides, or cribriforme.

11 Of the os occipitis.

Of these, only the os occipitis and ossa bregmatis are considered as proper to the cranium; the rest being common both to the cranium and face.

These bones are all harder at their surface than in their middle; and on this account they are divided into two tables, and a middle spongy substance called *diplöe*.

12 Of the Os Frontis.

In this, as in all the other bones, we shall consider its figure, structure, processes, depressions, and cavities; and the manner in which it is articulated with the other bones.

The os frontis has some resemblance in shape to the shell of the cockle. Externally it is convex, its concave side being turned towards the brain. This bone in the places where it is united to the temporal bones, is very thin, and has there no diplöe. It is likewise exceedingly thin in that part of the orbit of the eye which is nearest to the nose. Hence it is, that a wound in the eye, by a sword or any other pointed instrument, is sometimes productive of immediate death. In these cases, the sword passing through the weak part of the bone, penetrates the brain, and divides the nerves at their origin; or perhaps opens some blood-vessel, the consequences of which are soon fatal.

We observe on the exterior surface of this bone five apophyses or processes, which are easily to be distinguished. One of these is placed at the bottom and narrowest part of the bone, and is called the nasal process, from its supporting the upper end of the bones of the nose. The four others are called angular or orbitar processes. They assist to form the orbits, which are the cavities on which the eyes are placed. In each of these orbits there are two processes, one at the interior or great angle, and the other at the exterior or little angle of the orbit. They are called the angular processes. Between these a ridge is extended in form of an arch, and on this the eye-brows are placed. It is called the orbitar or superciliary ridge, and in some measure covers and defends the globe of the eye. There is a hole in this for the passage of the frontal vessels and nerves. This arch is interrupted near the nose by a small pit, in which the tendon of the musculus obliquus major of the eye is fixed. From the under part of each superciliary ridge a thin plate runs a considerable way backwards, and has the name of *orbitar*; the external and fore-part of this plate forms a sinuosity for lodging the lacrymal gland. Between the orbitar plates there is a large discontinuation of the bone, which is filled up by the cribriform part of the os ethmoides.

On examining the inner surface of this bone at its under and middle part, we observe an elevation in form of a ridge, which has been called the *spinous process*; it ascends for some way, dividing the bone into two considerable fossæ, in which the anterior lobes of the brain are placed. To a narrow furrow in this ridge is attached the extremity of the falx, as the membrane is called, which divides the brain into two hemispheres. The furrow becoming gradually wider, is continued to the upper and back part of the bone. It has the falx

2 fixed

(F) The bones of the fœtus being perfectly distinct, and the muscles in young persons not acting much, the shape of the head has been supposed to depend much on the management of children when very young. Vesalius, who has remarked the difference in people of different nations, observes, for instance, that the head of a Turk is conical, from the early use of the turban; whilst that of an Englishman is flattened by the chin-stay. Some of the latest physiologists suppose, with good reason, that this difference is chiefly owing to certain natural causes with which we are as yet unacquainted.

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fixed to it, and part of the longitudinal sinus lodged in it. Besides the two fossæ, there are many depressions, which appear like digital impressions, and owe their formation to the prominent circumvolutions of the brain.

In the fœtus, the forehead is composed of two distinct bones; so that in them the sagittal suture reaches from the os occipitis to the nose. This bone is almost every where composed of two tables and a diplöe. These two tables separating from each other under the eyes, form two cavities, one on each side of the face, called the frontal sinuses. These sinuses are lined with a soft membrane, called *membrana pituitaria*. In these sinuses a mucus is secreted, which is constantly passing through two small holes into the nostrils, which it serves to moisten.

The os frontis is joined by suture to many of the bones of the head, viz. to the parietal, maxillary, and temporal bones; to the os ethmoides; os sphenoides; os unguis; and ossa nasi. The suture which connects it with the parietal bones is called the *coronal suture*.

13 Of the parietal bones.

The parietal bones are two in number; they are very thin, and even transparent in some places. The particular figure of each of these bones is that of an irregular square, bordered with indentations through its whole circumference, except at its lower part. It will be easily conceived, that these bones which compose the superior and lateral parts of the cranium, and cover the greatest part of the brain, form a kind of vault. On their inner surface we observe the marks of the vessels of the dura mater; and at their upper edge the groove for the superior longitudinal sinus.

The ossa parietalia are joined to each other by the sagittal suture; to the os sphenoides and ossa temporum by the squamous suture; to the os occipitis by the lambdoidal suture (G), so called from its resemblance to the Greek letter lambda; and to the os frontis by the coronal suture.

In the fœtus, the parietal bones are separated from the middle of the divided os frontis by a portion of the cranium then unossified.

14 Of the occipital bone

The occipital bone forms the posterior and inferior parts of the skull; it approaches nearly to the shape of a lozenge, and is indented throughout three parts of its circumference.

There is a considerable hole in the inferior portion of this bone, called the *foramen magnum*, through which the medulla oblongata passes into the spine.—The nervi accessorii, and vertebral arteries, likewise pass through it. Behind the condyles are two holes for the passage of cervical veins into the lateral sinuses; and above them are two others for the passage of the eighth pair and accessory nerves out of the head. At the sides, and a little on the anterior part of the foramen magnum, are two processes, called the condyles, one on each side; they are of an oval figure, and are covered with cartilage.

The external surface of this bone has a large transverse arched ridge, under which the bone is very irregular, where it affords attachment to several muscles. On examining its inner surface, we may observe two ridges in form of a cross; one ascending from near the foramen magnum to the top of the bone; the upper end of this in which the falx is fixed, is hollow, for lodging the superior longitudinal sinus, and the under end has the third process of the dura mater fixed to it. The other ridge, which runs horizontally, is likewise hollow for containing the lateral sinuses. Four fossæ are formed by the cross, two above and two below. In the former are placed the posterior lobes of the brain, and in the latter the lobes of the cerebellum.

At the basis of the cranium, we observe the cuneiform process (which is the name given to the great apophysis at the fore part of this bone); it serves for the reception of the medulla oblongata.

The os occipitis is of greater strenth and thickness than either of the other bones of the head, though irregularly so; at its inferior part, where it is thinnest, it is covered by a great number of muscles.

This bone, from its situation, being more liable to be injured by falls, than any other bone of the head, nature has wisely given it the greatest strength at its upper part, where it is most exposed to danger.

It is joined to the parietal bones by the lambdoidal suture, and to the ossa temporum, by the additamentum of the temporal suture. It is likewise connected to the os sphenoides by the cuneiform process. It is by means of the os occipitis that the head is united to the trunk, the two condyles of this bone being connected to the superior oblique processes of the first vertebra of the neck.

15 Of the temporal bones

There are two temporal bones, one on each side.—We may distinguish in them two parts; one of which is called the *squamous* or *scaly part*, and the other *pars petrosa* from its hardness. This last is shaped like a pyramid.

Each of these divisions affords processes and cavities: externally there are three processes; one anterior, called the zygomatic process; one posterior, called the *mastoid* or *mamillary process*, from its resemblance to a nipple; and one inferior, called the *styloid process*, because it is shaped like a stiletto, or dagger.

The cavities are, 1. The meatus auditorius externus. 2. A large fossa which serves for the articulation of the lower jaw; it is before the meatus auditorius, and immediately under the zygomatic process. 3. The stylo-mastoid hole, so called from its situation between the styloid and mastoid processes; it is likewise styled the aquæduct of Fallopius, and affords a passage to the portio dura of the auditory, or seventh pair of nerves. 4. Below, and on the fore-part of the last foramen, we observe part of the jugular fossa, in which the beginning of the internal jugular vein is lodged. Anterior and superior to this fossa is the orifice of a foramen, through which passes the carotid artery. This foramen runs first upwards and then forwards, forming a kind of elbow, and terminates at the end of the os petrosum.—At this part of each temporal bone, we may observe the opening of the Eustachian tube, a canal which passes from the ear to the back part of the nose.

In examining the internal surface of these bones, we may remark the triangular figure of their petrous part which separates two fossæ; one superior and anterior; the other inferior and posterior: the latter of these composes part of the fossa, in which the cerebellum is placed;

(G) The lambdoidal suture is sometimes very irregular, being composed of many small sutures, which surround so many little bones called *ossa triquetra*, though perhaps improperly, as they are not always triangular.

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placed; and the former, a portion of the least fossa for the basis of the brain. On the posterior side of the pars petrosa, we observe the meatus auditorus internus, into which enters the double nerve of the seventh pair. On the under side of this process, part of a hole appears, which is common to the temporal and occipital bones; through it the lateral sinus, the eighth pair, and accessory nerves, pass out of the head.

The pars petrosa contains several little bones called the bones of the ear; which, as they do not enter into the formation of the cranium, shall be described when we are treating of the organs of hearing.

The ossa temporum are joined to the ossa malarum, by the zygomatic sutures; to the parietal bones, by the squamous sutures; to the os occipitis, by the lambdoidal suture; and to the sphenoid bone, by the suture of that name.

Of the os sphenoides.

This bone, from its situation amidst the other bones of the head, has been sometimes called *cuneiforme*. It is of a very irregular figure, and has been compared to a bat with its wings extended.

It is commonly divided into its middle part or body, and its sides or wings.

The fore part of the body has a spine or ridge, which makes part of the septum narium. The upper part of each wing forms a share of the temple. The fore part of this belongs to the orbit; while the under and back part, termed *spinous process*, is lodged in the base of the skull at the point of the pars petrosa. But two of the most remarkable processes are the pterygoid or aliform, one on each side of the body of the bone, and at no great distance from it. Each of these processes is divided into two wings, and of these the exterior one is the widest. The other terminates in a hook-like process.

The internal surface of this bone affords three fossæ. Two of these are formed by the wings of the bone, and make part of the lesser fossæ of the basis of the cranium. The third, which is smaller, is on the top of the body of the bone; and is called *cella turcica*, from its resemblance to a Turkish saddle. This fossa, in which the pituitary gland is placed, has posteriorly and anteriorly processes called the *clinoid processes*.

There are twelve holes in this bone, viz. six on each side. The first is the passage of the optic nerve and ocular artery; the second, or large slit transmits the third, fourth, sixth, and first part of the fifth pair of nerves with the ocular vein; the third hole gives passage to the second branch of the fifth pair; and the fourth hole to the third branch of the fifth pair of nerves. The fifth hole is the passage of the artery of the dura mater. The sixth hole is situated above the pterygoid process of the sphenoid bone; through it a reflected branch of the second part of the fifth pair passes.

Within the substance of the os sphenoides there are two sinuses separated by a bony plate. They are lined with the pituitary membrane; and like the frontal sinuses, separate a mucus which passes into the nostrils.

The os sphenoides is joined to all the bones of the cranium; and likewise to the ossa maxillaria, ossa malarum, ossa palati, and vomer.

This bone makes part of the basis of the skull, assists in forming the orbits, and affords attachment to several muscles.

The os ethmoides is situated at the fore part of the basis of the cranium, and is of a very irregular figure. From the great number of holes with which it is pierced, it is sometimes called *os cribriforme* or sieve-like bone.

17 Of the os ethmodies or cribriforme.

It consists of a middle part and two sides. The middle part is formed of a thin bony plate, in which are an infinite number of holes that afford a passage to filaments of the olfactory nerve. From the middle of this plate, both on the outside and from within, there rises up a process, which may be easily distinguished. The inner one is called *crista galli*, from its supposed resemblance to a cock's comb. To this process the falx of the dura mater is attached. The exterior process, which has the same common basis as the crista galli, is a fine lamella which is united to the vomer; and divides the cavity of the nostrils, though unequally, it being generally a little inclining to one side.

The lateral parts of this bone are composed of a cellular substance; and these cells are so very intricate, that their figure or number cannot be described. Many writers have on this account called this part of the bone the *labyrinth*. These cells are externally covered with a very thin bony lamella. This part of the bone is called the *os planum*, and forms part of the oribt.

The different cells of this bone, which are numerous, and which are every where lined with the pituitary membrane, evidently serve to enlarge the cavity of the nose, in which the organ of smelling resides.

This bone is joined to the os sphenoides, os frontis, ossa maxillaria, ossa palati, ossa nasi, ossa unguis, and vomer.

The ancients, who considered the brain as the seat of all the humours, imagined that this viscus discharged its redundant moisture through the holes of the ethmoid bone. And the vulgar still think, that abscesses of the brain discharge themselves through the mouth and ears, and that snuff is liable to get into the head; but neither snuff nor the matter of an abscess are more capable of passing through the cribriform bone, than the serosity which they supposed was discharged through it in a common cold. All the holes of the ethmoid bone are filled up with the branches of the olfactory nerve. Its inner part is likewise covered with the dura mater, and its cells are every where lined with the pituitary membrane; so that neither matter nor any other fluid can possibly pass through this bone either externally or internally. Matter is indeed sometimes discharged through the nostrils: but the seat of the disease is in the sinuses of the nose, and not in the brain; and imposthumations are observed to take place in the ear, which suppurate and discharge themselves externally.

Before we leave the bones of the head, we wish to make some general observations on its structure and figure.—As the cranium might have been composed of a single bone, the articulation of its several bones being absolutely without motion, it may be asked perhaps, Why such a multiplicity of bones, and so great number of sutures? Many advantages may possibly arise from this plurality of bones and sutures, which may not yet have been observed. We are able, however, to point out many useful ends, which could only be accomplished by this peculiarity of structure.—In this, as in all the other works of nature, the great wisdom of the Creator is evinced, and cannot fail to excite our admiration and gratitude.

The cranium, by being divided into several bones, grows much faster and with greater facility, than if it was

was composed of one piece only. In the fœtus, the bones, as we have before observed, are perfectly distinct from each other. The ossification begins in the middle of each bone, and proceeds gradually to the circumference. Hence the ossification, and of course the increase of the head, is carried on from an infinite number of points at the same time, and the bones consequently approach each other in the same proportion. To illustrate this doctrine more clearly, if it can want further illustration, suppose it necessary for the parietal bones which compose the upper part of the head, to extend their ossification, and form the fore part of the head likewise. Is it not evident, that this process would be much more tedious than it is now, when the os frontis and the parietal bones are both growing at the same time? Hence it happens, that the heads of young people, in which the bones begin to touch each other, increase slowly; and that the proportionate increase of the volume of the head is greater in three months in the fœtus, than it is perhaps in twenty-four months at the age of fourteen or fifteen years.

The sutures, exclusive of their advantages in suspending the processes of the dura mater, are evidently of great utility in preventing the too great extent of fractures of the skull.—Suppose, for instance, that by a fall or blow, one of the bones of the cranium becomes fractured. The fissure, which in a head composed of only one bone, would be liable to extend itself through the whole of it, is checked, and sometimes perhaps stopped by the first suture it meets, and the effects of the injury are confined to the bone on which the blow was received. Ruysch indeed, and some others, will not allow the sutures to be of any such use; but cases have been met with where they seemed to have had this effect, and in young subjects their utility in this respect must be still more obvious.

The spherical shape of the head seems likewise to render it more capable of resisting external violence than any other shape would do. In a vault, the parts mutually support and strengthen each other, and this happens in the cranium.

§ 2. *Proper Bones of the Face.*

18 Of the bones of the face.

The face, which consists of a great number of bones, is commonly divided into the upper and lower jaws. The upper jaw consists of thirteen bones, exclusive of the teeth. Of these, six are placed on each side of the maxilla superior, and one in the middle.

The bones, which are in pairs, are the ossa malarum, ossa maxillaria, ossa nasi, ossa unguis, ossa palati, and ossa spongiosa inferiora. The single bone is the vomer.

19 Of the ossa malarum.

These are the prominent square bones which are placed under the eyes, forming part of the orbits and the upper parts of the cheeks. Each of them affords three surfaces; one exterior and a little convex; a second superior and concave, forming the inferior part and sides of the orbit; and a third posterior, irregular, and hollowed for the lodgement of the lower part of the temporal muscle.

The angles of each bone form four processes, two of which may be called *orbitar processes*; of these the upper one is joined by suture to the os frontis, and that below to the maxillary bone. The third is connected with the os sphenoides by means of the transverse suture; and the fourth is joined to the zygomatic process of the temporal bone, with which it forms the zygoma.

20 Of the ossa maxillaria superiora.

These bones, which are of a very irregular figure, are so called because they form the most considerable portion of the upper jaw. They are two in number, and generally remain distinct through life.

Of the many processes which are to be seen on these bones, and which are connected with the bones of the face and skull, we shall describe only the most remarkable.

One of these processes is at the upper and fore part of the bone, making part of the side of the nose, and called the *nasal process*. Another forms a kind of circular sweep at the inferior part of the bone, in which are the alveoli or sockets for the teeth: this is called the *alveolar process*. A third process is united to the os malæ on each side. Between this and the nasal process there is a thin plate, which forms a share of the orbit, and lies over a passage for the superior maxillary vessels and nerves.—The alveolar process has posteriorly a considerable tuberosity on its internal surface, called the *maxillary tuberosity*.

Behind the alveolar process we observe two horizontal lamellæ, which uniting together, form part of the roof of the mouth, and divide it from the nose. The hollowness of the roof of the mouth is owing to this partition's being seated somewhat higher than the alveolar process.—At the fore part of the horizontal lamellæ there is a hole called *foramen incisivum*, through which small blood-vessels and nerves go between the mouth and nose.

In viewing these bones internally, we observe a fossa in the inferior portion of the nasal process, which, with the os unguis and os spongiosum inferius, forms a passage for the lachrymal duct.

Where these two bones are united to each other, they project somewhat upwards and forwards, leaving between them a furrow, into which the lower portion of the septum nasi is admitted.

Each of these bones being hollow, a considerable sinus is formed under its orbitar part. This cavity, which is usually named after Highmore, though it was described by Fallopius and others before his time, is lined with the pituitary membrane. It is intended for the same purposes as the other sinuses of the nose, and opens into the nostrils.

The ossa maxillaria are connected with the greater part of the bones of the face and cranium, and assist in forming not only the cheeks, but likewise the palate, nose, and orbits.

21 Of the ossa nasi.

The ossa nasi form two irregular squares. They are thicker and narrower above than below. Externally they are somewhat convex, and internally slightly concave. These bones constitute the upper part of the nose. At their fore part they are united to each other, above to the os frontis, by their sides to the ossa maxillaria superiora, posteriorly and interiorly to the septum narium, and below to the cartilages that compose the rest of the nostrils.

22 Of the ossa unguis.

These little transparent bones owe their name to their supposed resemblance to a finger-nail. Sometimes they are called *ossa lachrymalia*, from their concurring with the nasal process of each maxillary bone in forming a lodgement for the lachrymal sac and duct.

The oſſa unguis are of an irregular figure. Their external ſurface conſiſts of two ſmooth parts, divided by a middle ridge. One of theſe parts, which is concave and neareſt to the noſe, ſerves to ſupport the lachrymal ſac and part of the lachrymal duct. The other, which is flat, forms a ſmall part of the orbit.

Each of theſe bones is connected with the os frontis, os ethmoides, and os maxillare ſuperius.

Of the oſſa palati. Theſe bones, which are ſituated at the back part of the roof of the mouth, between the os ſphenoides and the oſſa maxillaria ſuperiora, are of a very irregular ſhape, and ſerve to form the naſal and maxillary foſſa, and a ſmall portion of the orbit. Where they are united to each other, they riſe up into a ſpine on their internal ſurface. This ſpine appears to be a continuation of that of the ſuperior maxillary bones, and helps to form the ſeptum narium.

Theſe bones are joined to the oſſa maxillaria ſuperiora, os ethmoides, os ſphenoides, and vomer.

24 *Of the vomer.* This bone derives its name from its reſemblance to a ploughſhare. It is a long and flat bone, ſomewhat thicker at its back than at its fore part. At its upper part we obſerve a furrow extending through its whole length. The poſterior and largeſt part of this furrow receives a proceſs of the ſphenoid bone. From this the furrow advances forwards, and becoming narrower and ſhallower, receives ſome part of the naſal lamella ethmoidea; the reſt ſerves to ſupport the middle cartilage of the noſe.

The inferior portion of this bone is placed on the naſal ſpine of the maxillary and palate bones, which we mentioned in our deſcription of the oſſa palati.

The vomer is united to the os ſphenoides, os ethmoides, oſſa maxillaria ſuperiora, and oſſa palati. It forms part of the ſeptum narium, by dividing the back part of the noſe into two noſtrils.

25 *Of the oſſa ſpongioſa inferiora.* The parts which are uſually deſcribed by this name, do not ſeem to deſerve to be diſtinguiſhed as diſtinct bones, except in young ſubjects. They conſiſt of a ſpongy lamella in each noſtril, which is united to the ſpongy lamina of the ethmoid bone, of which they are by ſome conſidered as a part.

Each of theſe lamellæ is longeſt from behind forwards; with its convex ſurface turned towards the ſeptum narium, and its concave part towards the maxillary bone, covering the opening of the lachrymal duct, into the noſe.

Theſe bones are covered with the pituitary membrane; and, beſides their connection with the ethmoid bone, are joined to the oſſa maxillaria ſuperiora, oſſa palati, and oſſa unguis.

26 *Of the maxilla inferior.* The maxilla inferior, or lower jaw, which in its ſhape reſembles a horſe-ſhoe, conſiſts of two diſtinct bones in the fœtus; but theſe unite together ſoon after birth, ſo as to form only one bone. The upper edge of this bone, like the os maxillare ſuperius, has an alveolar proceſs, furniſhed with ſockets for the teeth.

On each ſide the poſterior part of the bone riſes almoſt perpendicularly into two proceſſes. The higheſt of theſe, called the coronoid proceſs, is pointed and thin, and ſerves for the inſertion of the temporal muſcle. The other, or condyloid proceſs, as it is called, is ſhorter and thicker, and ends in an oblong rounded head, which is received into a foſſa of the temporal bone, and is formed for a moveable articulation with the cranium. This joint is furniſhed with a moveable cartilage. At the bottom of each coronoid proceſs, on its inner part, we obſerve a foramen extending under the roots of all the teeth, and terminating at the outer ſurface of the bone near the chin. Each of theſe canals tranſmits an artery, vein, and nerve, from which branches are ſent off to the teeth.

The lower jaw is capable of a great variety of motion. By ſliding the condyles from the cavity towards the eminences on each ſide, we bring it horizontally forwards, as in biting; or we may bring the condyles only forward, and tilt the reſt of the jaw backward, as in opening the mouth. We are likewiſe able to ſlide the condyles alternately backwards and forwards from the cavity to the eminence, and *vice verſa*, as in grinding the teeth. The cartilages, by adapting themſelves to the different inequalities in theſe ſeveral motions of the jaw, ſerve to ſecure the articulation, and to prevent any injuries from friction.

The alveolar proceſſes are compoſed of an outer and inner bony plate, united together by thin partitions, which at the fore part of the jaw divide the proceſſes into as many ſockets as there are teeth. But at the back part of the jaw, where the teeth have more than one root, we find a diſtinct cell for each root. In both jaws theſe proceſſes begin to be formed with the teeth; they likewiſe accompany them in their growth, and gradually diſappear when the teeth are removed.

§ 3. *Of the Teeth.*

27 *Of the teeth.* The teeth are bones of a particular ſtructure, formed for the purpoſes of maſtication and the articulation of the voice. It will be neceſſary to conſider their compoſition and figure, their number and arrangement, and the time and order in which they appear.

In each tooth we may diſtinguiſh a body, a neck, and a root or fangs.

The body of the tooth is that part which appears above the gums. The root is fixed into the ſocket, and the neck is the middle part between the two.

The teeth are compoſed of two ſubſtances, viz. enamel and bone. The enamel, or the vitreous or cortical part of the tooth, is a white and very hard and compact ſubſtance peculiar to the teeth, and appears fibrous or ſtriated when broken. This ſubſtance is thickeſt on the grinding ſurface, and becoming gradually thinner, terminates inſenſibly at the neck of the tooth. Ruyſch * affirmed, that he could trace the arteries into the hardeſt part of the teeth; Liewenhoeck † ſuſpected the fibres of the enamel to be ſo many veſſels; and Monro ‡ ſays, he has frequently injected the veſſels of the teeth in children, ſo as to make the inſide of the cortex appear perfectly red. But is certain, that it is not tinged by a madder diet, and that no injection will ever reach it, ſo that it has no appearance of being vaſcular §.

* *Theſaur* 10. no. 27.
† *Arcan. Natur. continuat. Epiſtol.*
‡ *Anat. of the Human Bones.*
§ *Hunter on the Teeth.*

The bony part, which compoſes the inner ſubſtance of the body, neck, and root of the tooth, reſembles other bones in its ſtructure, but it is much harder than the moſt compact part of bones in general. As a tooth when once formed receives no tinge from a madder diet, and as the minuteſt injections do not penetrate into its ſubſtance, this part of a tooth has, like the enamel, been ſuppoſed not to be vaſcular. But when we conſider that the fangs of a tooth are inveſted by by a periosteum, and that the swellings of these fangs are analogous to the swellings of other bones, we may reasonably conclude, that there is a similarity of structure; and that this bony part has a circulation through its substance, although from its hardness we are unable to demonstrate its vessels.

In each tooth we find an inner cavity, into which enter an artery, vein, and nerve. This cavity begins by a small opening, and becoming larger, terminates in the body of the tooth. In advanced life this hole sometimes closes, and the tooth is of course rendered insensible.

The periosteum surrounds the teeth from their fangs to a little beyond their bony sockets, where we find it adhering to the gums. This membrane, while it incloses the teeth, serves at the same time to line the sockets, so that it may be considered as common to both.

The teeth are likewise secured in their sockets by means of the gums; a red, vascular, firm, and elastic substance, that possesses but little sensibility. In the gums of infants we find a hard ridge extending thro' their whole length, but no such ridge is to be seen in old people who have lost their teeth.

The number of the teeth in both jaws at full maturity, usually varies from twenty-eight to thirty-two. They are commonly divided into three classes, viz. incisores, canini, and grinders or molares (H). The incisores are the four teeth in the fore part of each jaw. They have each of them two surfaces; one anterior and convex, the other posterior and slightly concave, both of which terminate in a sharp edge. They are called *incisores* from their use in dividing the food. They are usually broader and thicker in the upper than in the under jaw; and, by being placed somewhat obliquely, generally fall over the latter.

The canini derive their name from their resemblance to a dog's tusks, being the longest of all the teeth. We find one on each side of the incisores, so that there are two canini in each jaw. Their fang resembles that of the incisores, but is much larger; and in their shape they appear like an incisor with its edge worn off, so as to terminate in a narrow point.

These teeth not being calculated for cutting and dividing the food like the incisores, or for grinding it like the molares, seem to be intended for laying hold of substances (I).

The molares or grinders, of which there are ten in each jaw, are so called, because from their shape and size they are fitted for grinding the food. Each of the incisores and canini is furnished only with one fang; but in the molares of the under jaw we constantly find two fangs, and in those of the upper jaw three fangs. These fangs are sometimes separated into two points, and each of these points has sometimes been described as a distinct fang.

The two first of the molares, or those nearest to the canine teeth on each side, differ from the other three, and are with great propriety named *bicuspides* by Mr Hunter. They have sometimes only one root, and seem to be of a middle nature between the incisores and the larger molares. The two next are much larger. The fifth or last grinder on each side is smaller and shorter than the rest; and from its not cutting the gum till after the age of twenty, and sometimes not till much later in life, is called *dens sapientiæ*.

There is in the structure and arrangement of all these teeth an art which cannot be sufficiently admired. To understand it properly, it will be necessary to consider the under jaw as a kind of lever, with its fixed points at its articulations with the temporal bones:—it will be right to observe, too, that its powers arise from its different muscles, but in elevation chiefly from the temporalis and masseter; and that the aliment constitutes the object of resistance. It will appear, then, that the molares, by being placed nearest the centre of motion, are calculated to press with a much greater force than the other teeth, independent of their grinding powers which they possess by means of the pterygoid muscles; and that it is for this reason we put between them any hard body we wish to break.

The canini and incisores are placed farther from this point, and of course cannot exert so much force; but they are made for cutting and tearing the food, and this form seems to make amends for their deficiency in strength.

There are examples of children who have come into the world with two, three, and even four teeth; but these examples are very rare; and it is seldom before the seventh, eighth, or ninth month after birth, that the incisores, which are the first formed, begin to pass through the gum. The symptoms of dentition, however, in consequence of irritation from the teeth, frequently take place in the fourth or fifth month.—About the twentieth or twenty-fourth month, the canini and two molares make their appearance.

The dangerous symptoms that sometimes accompany dentition, are owing to the pressure of the teeth on the gum, which they irritate so as to excite pain and inflammation. This irritation seems to occasion a gradual wasting of the gum at the part, till at length the tooth makes its appearance.

The symptoms are more or less alarming, in proportion to the resistance which the gum affords to the teeth, and according to the number of teeth which may chance to seek a passage at the same time. Were they all to appear at once, children would fall victims to the pain and excessive irritation; but Nature has so very wisely disposed them, that they usually appear one after the other, with some distance of time between each. The first incisor that appears is generally in the lower jaw, and is followed by one in the upper

(H) Mr Hunter has thought proper to vary this division. He retains the old name of *incisores* to the four fore teeth, but he distinguishes the canine teeth by the name of the *cuspidati*. The two teeth which are next to these, and which have been usually ranked with the molares, he calls the *bicuspides*; and he gives the name of *grinders* only to the three last teeth on each side.

(I) Mr Hunter remarks of these teeth, that we may trace in them a similarity in shape, situation, and use, from the most imperfectly carnivorous animal, which we believe to be the human species, to the lion, which is the most perfectly carnivorous.

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per jaw. Sometimes the canini, but more commonly one of the molares, begins to pass through the gum first.

These 20 teeth, viz. eight incisores, four canini, and eight molares, are called *temporary* or *milk teeth*, because they are all shed between the age of seven and 14, and are succeeded by what are called the *permanent* or *adult teeth*. The latter are of a firmer texture, and have larger fangs.

These adult teeth being placed in a distinct set of alveoli, the upper sockets gradually disappear, as the under ones increase in size, till at length the temporary, or upper teeth, having no longer any support, consequently fall out.

To these 20 teeth, which succeed the temporary ones, 12 others are afterwards added, viz. three molares on each side in both jaws: and in order to make room for this addition, we find that the jaws gradually lengthen in proportion to the growth of the teeth; so that with 20 teeth, they seem to be as completely filled as they are afterwards with 32. This is the reason why the face is rounder and flatter in children than in adults.

With regard to the formation of the teeth, we may observe, that in a fœtus of four months, the alveolar process appears only as a shallow longitudinal groove, divided by minute ridges into a number of intermediate depressions; in each of which we find a small pulpy substance, surrounded by a vascular membrane. This pulp gradually ossifies, and its lower part is lengthened out to form the fang. When the bony part of the tooth is formed, its surface begins to be incrusted with the enamel. How the latter is formed and deposited, we are not yet able to determine.

The rudiments of some of the adult teeth begin to be formed at a very early period, for the pulp of one of the incisores may generally be perceived in a fœtus of eight months, and the ossification begins in it soon after birth. The first bicuspis begins to ossify about the fifth or sixth, and the second about the seventh year. The first adult grinder cuts the gum about the 12th, the second about the 18th, and the third, or *dens sapientiæ*, usually between the 20th and 30th year.

The teeth, like other bones, are liable to be affected by disease. Their removal is likewise the natural consequence of old age; for as we advance in life, the alveoli fill up, and the teeth, especially the incisores, fall out. When this happens, the chin projects forward, and the face is much shortened.

§ 4. *Of the Os Hyoides.* (K.)

28. The os hyoides, which is placed at the root of the tongue, was so called by the ancients on account of its supposed resemblance to the Greek letter υ.

It will be necessary to distinguish in it, its body, horns, and appendices.

The body, which is the middle and broadest part of the bone, is so placed that it may be easily felt at the fore part of the throat. Anteriorly it is irregularly convex, and its inner surface is unequally concave. Its cornua, or horns, which are flat and a little bent, being much longer than the body part, may be described as forming the sides of the υ. The appendices, or little horns, as they are called by M. Winslow, and some other writers, are two processes which rise up from the articulations of the cornua with the body, and are usually connected with the styloid process on each side by means of a ligament.

The uses of this bone are to support the tongue, and afford attachment to a great number of muscles; some of which perform the motions of the tongue, while others act on the larynx and fauces.

Sect. III. *Of the Bones of the Trunk.*

The trunk of the skeleton consists of the spine, the thorax, and the pelvis. 29.

§ 1. *Of the Spine.*

The spine is composed of a great number of bones called *vertebræ*, forming a long bony column, in figure not much unlike the letter *ſ*. This column, which extends from the head to the lower part of the body, may be said to consist of two irregular and unequal pyramids, united to each other in that part of the loins where the last lumbar vertebra joins the os sacrum. 30.

The vertebræ of the upper and longest pyramid are called *true vertebræ*, in contradistinction to those of the lowermost pyramid, which, from their being immoveable in the adult, are styled *false vertebræ*. It is upon the bones of the spine that the body turns; and it is to this circumstance they owe their name, which is derived from the Latin verb *vertere*, to turn.

The true vertebræ are divided into three classes of cervical, dorsal, and lumbar vertebræ.—The false vertebræ consist of the os sacrum and os coccygis.

In each vertebra, as in other bones, it will be necessary to remark the body of the bone, its processes, and cavities.

The body, which is convex before, and concave behind, where it assists in forming the cavity of the spine, may be compared to part of a cylinder cut off transversely.

Each vertebra affords seven processes. The first is at the back part of the vertebra, and from its shape and direction is named the *spinous process*. On each side of this are two others, which, from their situation with respect to the spine, are called *transverse processes*. The four others are styled *oblique* or *articular processes*. They are much smaller than the spinous or transverse ones. Two of them are placed on the upper, and two on the lower part of each vertebra, rising from near the basis of each transverse process. They have gotten the name of *oblique processes*, from their situation with respect to the processes with which they are articulated; and they are sometimes styled *articular processes*, from the manner in which they are articulated with each other; the two superior processes of one vertebra being articulated with

(K) This bone is very seldom preserved with the skeleton, and cannot be included among the bones of the head, or any other division of the skeleton. Thomas Bartholin has perhaps very properly described it among parts contained in the mouth; but the generality of anatomical writers have placed it, as it is here, after the bones of the face.

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with the two inferior processes of the vertebra above it. Each of these processes is covered with cartilage at its articulation, and their articulations with each other are by a species of ginglimus.

In each vertebra, between its body and its processes, we find a hole large enough to admit a finger. These holes or foramina, correspond with each other through all the vertebræ, and form the long bony channel in which the spinal marrow is placed. We may likewise observe four notches in each vertebra. Two of these notches are at the upper, and two at the lower part of the bone, between the oblique processes and the body of the vertebra. Each of these notches meeting with a similar opening in the vertebra above or below it, forms a foramen for the passage of blood-vessels, and of the nerves out of the spine.

The bones of the spine are united together by means of a substance, which in young subjects appears to be of a ligamentous, but in adults more of a cartilaginous nature. This intervertebral substance, which forms a kind of partition between the several vertebræ, is thicker and more flexible between the lumber vertebræ than in the other parts of the spine, the most considerable motions of the trunk being performed on those vertebræ. This substance being very elastic, the extension and flexion of the body, and its motion backwards and forwards, to either side, are performed with great facility. This elasticity seems to be the reason why people who have been long standing, or have carried a considerable weight, are found to be shorter than when they have been long in bed. In the two first instances the intervertebral cartilages (as they are usually called) are evidently more exposed to compression than when we are in bed in an horizontal posture.

In advanced life these cartilages become shrivelled, and of course lose much of their elasticity. This may serve to account for the decrease in stature and the stooping forward which are usually to be observed in old people.

Besides the connection of the several vertebræ by means of this intervertebral substance, there are likewise many strong ligaments, both external and internal, which unite the bones of the spine to each other. Their union is also strengthened by a variety of strong muscles that cover and surround the spine.

The bones of the spine are found to diminish in density, and to be less firm in their texture in proportion as they increase in bulk; so that the lowermost vertebræ, though the largest, are not so heavy in proportion as the upper ones. By this means the size of these bones is increased without adding to their weight: a circumstance of no little importance in a part like the spine, which, besides flexibility and suppleness, seems to require lightness as one of its essential properties.

In very young children, each vertebra consists of three bony pieces united by cartilages which afterwards ossify.

31 Vertebræ of the neck.

There are seven vertebræ of the neck—they are of a firmer texture than the other bones of the spine. Their transverse processes are forked for the lodgement of muscles, and at the bottom of each we observe a foramen, through which pass the cervical artery and vein. The first and second of these vertebræ must be described more particularly. The first approaches almost to an oval shape—On its superior surface it has two cavities which admit the condyles of the occipital bone with which it is articulated. This vertebra, which is called *atlas* from its supporting the head, cannot well be described as having either body or spinous process, being a kind of bony ring. Anteriorly, where it is articulated to the odontoid process of the second vertebra, it is very thin. On its upper surface it has two cavities which admit the condyles of the occipital bone. By this connection the head is allowed to move forwards and backwards, but has very little motion in any other direction.

The second vertebra has gotten the name of *dentata*, from its having, at its upper and interior part, a process called the *odontoid* or *tooth-like process*, which is articulated with the atlas, to which this second vertebra may be said to serve as an axis. This odontoid process is of a cylindrical shape, somewhat flattened, however, anteriorly and posteriorly. At its fore-part where it is received by the atlas, we may observe a smooth, convex, articulating surface. It is by means of this articulation that the head performs its rotatory motion, the atlas in that case moving upon this odontoid process as upon a pivot. But when this motion is in any considerable degree, or, in other words, when the head moves much either to the right or left, all the cervical vertebræ seem to assist, otherwise the spinal marrow would be in danger of being divided transversely by the first vertebra.

32 Vertebræ of the back.

The spinous process of each of the cervical vertebræ is shorter, and their articular processes more oblique, than in the other bones of the spine.

These 12 vertebræ are of a middle size between those of the neck and loins. At their sides we may observe two depressions, one at the upper and the other at the lower part of the body of each vertebræ; which uniting with similar depressions in the vertebræ above and below, form articulating surfaces, covered with cartilages, for receiving the heads of the ribs; and at the forepart of their transverse process (excepting the two last) we find an articulating surface for receiving the tuberosity of the ribs.

33 Lumbar vertebræ.

These five vertebræ differ only from those of the back in their being larger, and in having their spinous processes at a greater distance from each other. The most considerable motions of the truk are made on these vertebræ; and these motions could not be performed with so much ease, were the processes placed nearer to each other.

34 Os sacrum.

The os sacrum, which is composed of five or six pieces in young subjects, becomes one bone in more advanced age.

It is nearly of a triangular figure, its inferior portion being bent a little forwards. Its superior part has two oblique processes which are articulated with the last of the lumbar vertebræ; and it has likewise commonly three small spinous processes, which gradually become shorter, so that the lowermost is not so long as the second, nor the second as the uppermost. Its transverse processes are formed into one oblong process, which becomes gradually smaller as it descends. Its concave or anterior side is usually smooth, but its posterior convex side has many prominences (the most remarkable of which are the spinous processes just now mentioned), which are filled up and covered with the muscular and tendinous parts behind.

This

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This bone has five pair of holes, which afford a passage to blood-vessels, and likewise to the nerves that are derived from the spinal marrow, which is continued even here, being lodged in a triangular cavity, that becomes smaller as it descends, and at length terminates obliquely at the lower part of this bone. Below the third division of the os sacrum, this canal is not completely bony as in the rest of the spine, being secured at its back part only by a very strong membrane, so that a wound at that part must be extremely dangerous.

The os sacrum is united laterally to the ossa innominata or hip-bones, and below to the coccyx.

35 Os coccyx. The coccyx, which, like the os sacrum, is in young people made up of three or four distinct parts, usually becomes one bone in the adult state.

It serves to support the intestinum rectum; and, by its being capable of some degree of motion at its articulation with the sacrum, and being like that bone bent forwards, we are enabled to sit with ease.

This bone is nearly of a triangular shape, being broadest at its upper part, and from thence growing narrower to its apex, where it is not bigger than the little finger.

It has got its name from its supposed resemblance to a cuckow's beak. It differs greatly from the vertebræ, being commonly without any processes, and having no cavity for the spinal marrow, or foramina for the transmission of nerves.

The spine, of which we have now finished the anatomical description, is destined for many great and important uses. The medulla spinalis is lodged in its bony canal secure from external injury. It serves as a defence to the abdominal and thoracic viscera, and at the same time supports the head, and gives a general firmness to the whole trunk.

We have before compared it to the letter *ʃ*, and its different turns will be found to render it not very unlike the figure of that letter. In the neck we see it projecting somewhat forward to support the head, which without this assistance would require a greater number of muscles.—Lower down, in the thorax, we find it taking a curved direction backwards, and of course increasing the cavity of the chest. After this, in the loins, it again projects forwards in a direction with the centre of gravity, by which means we are easily enabled to keep the body in an erect posture, for otherwise we should be liable to fall forward. Towards its inferior extremity, however, it again recedes backward, and thus assists in forming the pelvis, the name given to the cavity in which the urinary bladder, intestinum rectum, and other viscera are placed.

If this bony column had been formed only of one piece, it would have been much more easily fractured than it is now: and by confining the trunk to a stiff situation, a variety of motions would have been altogether prevented, which are now performed with ease by the great number of bones of which it is composed.

It is firm, and yet to this firmness there is added a perfect flexibility. If it be required to carry a load upon the head, the neck becomes stiff with the assistance of its muscles, and accommodates itself to the load, as if it was composed only of one bone—In stooping likewise, or in turning to either side, the spine turns itself in every direction, as if all its bones were separated from each other.

In a part of the body, like the spine, that is made up of so great a number of bones, and intended for such a variety of motion, there must be a greater danger of dislocation than fracture; but we shall find, that this is very wisely guarded against in every direction by the processes belonging to each vetrebra, and by the ligaments, cartilages, &c. by which these bones are connected with each other.

§ 2. *Of the Bones of the Thorax.* 36

THE thorax, or chest, is composed of many bones, viz. the sternum which is placed at its anterior part, twelve ribs on each side which make up its lateral parts, and the dorsal vertebræ which constitute its posterior part. These last have been already described.

The sternum is the long bone which extends itself from the upper to the lower part of the breast anteriorly, and to which the ribs and the clavicles are articulated. 37 Of the sternum.

In children it is composed of several bones united by cartilages; but as we advance in life, most of these cartilages ossify, and the sternum in the adult state is found to consist only of three pieces, and sometimes becomes one bone. It is however generally described as being composed of three parts—one superior, which is broad, thick, and short; and one in the middle, which is thinner, narrower, and longer than the other.

It terminates at its lower part by a third piece, which is called the *xyphoid*, or *sword-like cartilage*, from its supposed resemblance to the blade of a sword, and because in young subjects it is commonly in a cartilaginous state.

We have already observed, that this bone is articulated with the clavicle on each side. It is likewise joined to the fourteen true ribs, *viz.* seven on its right and seven on its left side.

The ribs are bones shaped like a bow, forming the sides of the chest. There are twelve on each side. They are distinguished into true and false ribs: The seven upper ribs which are articulated to the sternum are called *true ribs*, and the five lower ones that are not immediately attached to that bone are called *false ribs*. 38 Of the ribs.

On the inferior and interior surface of each rib, we observe a sinuosity for the lodgement of an artery, vein, and nerve.

The ribs are not bony through their whole length, their anterior part being cartilaginous. They are articulated with the vertebræ and sternum. Every rib (or at least the greater number of them) has at its posterior part two processes; one at its extremity called the head of the rib, by means of which it is articulated with the body of two vertebræ; and another, called its tuberosity, by which it is articulated with the transverse process of the lowest of these two vertebræ. The first rib is not articulated by its extremity to two vertebræ, being simply attached to the upper part of the first vertebra of the back. The seven superior or true ribs are articulated anteriorly with the sternum by their cartilages; but the false ribs are supported in a different manner—the eighth, which is the first of these ribs, being

 being attached by its cartilage to the seventh; the ninth to the eighth, &c.

The two lowermost ribs differ likewise from all the rest in the following particulars: They are articulated only with the body of the vertebra, and not with a transverse process; and anteriorly, their cartilage is loose, not being attached to the cartilages of the other ribs; and this seems to be, because the most considerable motions of the trunk are not performed on the lumbar vertebræ alone, but likewise on the two last vertebræ of the back; so that if these two ribs had been confined at the fore part like the other ribs, and had been likewise articulated with the bodies of two vertebræ, and with the transverse processes, the motion of the two last vertebræ, and consequently of the whole trunk, would have been impeded.

The ribs help to form the cavity of the thorax; they afford attachment to different muscles; they are useful in respiration; and they serve as a security to the heart and lungs.

39. § 3. *Of the Bones of the Pelvis.*

The pelvis is composed of the os sacrum, os coccygis, and two ossa innominata. The two first of these bones were included in the account of the spine, to which they more properly belong.

In children, each os innominatum is composed of three distinct bones; but as we advance in life the intermediate cartilages gradually ossify, and the marks of the original separation disappear, so that they become one irregular bone; still however continuing to retain the names of ilium, ischium, and pubis, by which their divisions were originally distinguished, and to be described as three different bones by the generality of anatomists. The os ilium forms the upper and most considerable part of the bone, the os ischium its lower and posterior portion, and the os pubis its fore part.

40 Os ilium. The os ilium or haunch bone, is articulated posteriorly to the os sacrum by a firm cartilaginous substance, and is united to the os pubis before and to the os ischium below. Its superior portion is thin, and terminates in a ridge called the crista or spine of the ilium, and more commonly known by the name of the haunch. This crista rises up like an arch; being turned somewhat outwards, so as to resemble the wings of a phaeton.

Externally this bone is unequally prominent and hollowed for the lodgement of muscles; internally we find it smooth and concave. At its lower part there is a considerable ridge on its inner surface. This ridge extends from the os sacrum, and corresponds with a similar prominence both on that bone and the ischium; forms with the inner part of the ossa pubis what in midwifery is termed the brim of the pelvis.

The crista, or spine, which at first is an epiphysis, has two considerable tuberosities; one anteriorly, and the other posteriorly, which is the largest of the two: These, from their projecting more than the parts of the bones below them, have gotten the name of spinal processes. From the anterior spinous process, the sartorius and tensor vaginæ femoris muscles have their origin; and below the posterior process we observe a considerable niche in the bone, which, in the recent subject, is formed into a large foramen, by means of a strong ligament that is stretched over its lower part from the os sacrum to the sharp-pointed process of the ischium. This hole affords a passage to the great sciatic nerve, and to the posterior crural vessels under the pyriform muscle, part of which likewise passes out here.

41 Os ischium. The os ischium, or hip-bone, which is of a very irregular figure, constitutes the lower lateral parts of the pelvis, and is commonly divided into its body, tuberosity, and ramus. The body forms the lower and most considerable portion of the acetabulum, and sends a sharp-pointed process backwards, called the spine of the ischium. To this process the ligament adheres, which was just now spoken of, as forming a foramen for the passage of the sciatic nerve.—The tuberosity which is the lowest part of the trunk, and supports us when we sit, is large and irregular, affording origin to several muscles. From this tuberosity we find the bone becoming thinner and narrower. This part, which has the name of ramus or branch, passes forwards and upwards, and concurs with the ramus of the os pubis, to form a large hole called the *foramen magnum ischii*, or *thyroideum*, as it is sometimes named, from its resemblance to a door or shield. This hole, which in the recent subject is closed by a strong membrane called the obturator ligament, affords through its whole circumference attachment to muscles. At its upper part where we observe a niche in the bone, it gives passage to the obturator vessels and nerves, which go to the inner part of the thigh. Nature seems every where to avoid an unnecessary weight of bone, and this foramen, no doubt, serves to lighten the bones of the pelvis.

42 Os pubis. The os pubis or share-bone, which with its fellow forms the fore-part of the pelvis, is the smallest division of the os innominatum. It is united to its fellow by means of a strong cartilage, which forms what is called the symphysis pubis.

In each os pubis we may distinguish the body of the bone, its angle, and ramus. The body or outer part is united to the os ilium. The angle comes forward to form the symphysis, and the ramus is a thin process which unites with the ramus of the ischium, to form the foramen thyroideum.

The three bones we have described as composing each os innominatum, all assist in forming the acetabulum, in which the head of the os femoris is received. This cavity is every where lined with a smooth cartilage, excepting at its inner part, where we may observe a little fossa, in which are lodged the mucilaginous glands of the joint. We may likewise notice the pit or depression made by the round ligament, as it is improperly called, which, by adhering to this cavity and to the head of the thigh-bone, helps to secure the latter in the socket.

These bones, which are united to each other and to the spine by many very strong ligaments, serves to support the trunk, and to connect it with the lower extremities; and at the same time to form the pelvis or bason, in which are lodged the intestines and urinary bladder, and in women the uterus; so that the study of this part of osteology is of the utmost importance to midwifery.

It is worthy of observation, that in women the os sacrum is usually shorter, broader, and more hollowed, the ossa ilia more expanded, and the inferior opening of the pelvis larger than in men.

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Sect. IV. *Of the Extremities.*

43. These parts of the skeleton consist of the upper extremity and the lower.

§ 1. *Of the* Upper Extremity.

44. This consists of the shoulder, the arm, and the hand.

1. Of the Shoulder.

45. The shoulder consists of two bones, the clavicula and the scapula.

46 Of the clavicula. The former, which is so named from its resemblance to the key in use amongst the ancients, is a little curved at both its extremities like an italic *f*. It is likewise called *jugulum*, or collar-bone, from its situation. It is about the size of the little finger, but longer, and being of a very spongy substance is very liable to be fractured. In this, as in other long bones, we may distinguish a body and two extremities. The body is rather flattened than rounded. The anterior extremity is formed into a slightly convex head, which is nearly of a triangular shape. The inferior surface of the head is articulated with the sternum. The posterior extremity, which is flatter and broader than the other, is connected to a process of the scapula, called *acromion*. Both these articulations are secured by ligaments, and in that with the sternum we meet with a moveable cartilage, to prevent any injury from friction.

The clavicle serves to regulate the motions of the scapula, by preventing it from being brought too much forwards, or carried too far backwards. It affords origin to several muscles, and helps to cover and protect the subclavian vessels, which derive their name from their situation under this bone.

47 Of the scapula. The scapula, or shoulder-blade, which is nearly of a triangular shape, is fixed to the posterior part of the true ribs, somewhat in the manner of a buckler. It is of a very unequal thickness, and like all other broad, flat bones, is somewhat cellular. Exteriorly it is convex, and interiorly concave, to accommodate itself to the convexity of the ribs. We observe in this bone three unequal sides, which are thicker and stronger than the body of the bone, and are therefore termed its *costæ*. The largest of the three, called also the basis, is turned towards the vertebræ. Another, which is less than the former, is below this; and the third, which is the least of the three, is at the upper part of the bone. Externally the bone is elevated into a considerable spine, which rising small at the basis of the scapula, becomes gradually higher and broader, and divides the outer surface of the bone into two fossæ. The superior of these, which is the smallest, serves to lodge the supra spinatus muscle; and the inferior fossa, which is much larger than the other, gives origin to the infra spinatus. This spine terminates in a broad and flat process at the top of the shoulder, called the *processus acromion*, to which the clavicle is articulated. This process is hollowed at its lower part to allow a passage to the supra and infra spinati muscles. The scapula has likewise another considerable process at its upper part, which, from its resemblance to the beak of a bird, is called the *coracoid process*. From the outer side of this coracoid process, a strong ligament passes to the processus acromion, which prevents a luxation of the os humeri upwards. A third process begins by a narrow neck, and ends in a cavity called *glenoid*, for the connection of the os humeri.

The scapula is articulated with the clavicle and os humeri, to which last it serves as a fulcrum; and by varying its position it affords a greater scope to the bones of the arm in their different motions. It likewise gives origin to several muscles, and posteriorly serves as a defence to the trunk.

2. Bones of the Arm.

The arm is commonly divided into two parts, which are articulated to each other at the elbow. The upper part retains the name of arm, properly so called, and the lower part is usually called the fore-arm. 48.

The arm is composed of a single bone called *os humeri*. This bone, which is almost of a cylindrical shape, may be divided into its body and its extremities. 49.

The upper extremity begins by a large, round smooth head, which is admitted into the glenoid cavity of the scapula. On the upper and fore part of the bone there is a groove for lodging the long head of the biceps muscle of the arm; and on each side of the groove, at the upper end of the bone, there is a tubercle to which the spinata muscles are fixed.

The lower extremity has several processes and cavities. The principal processes are its two condyles, one exterior and the other interior, and of these the last is the largest. Between these two we observe two lateral protuberances, which, together with a middle cavity, form as it were a kind of pully upon which the motions of the fore-arm are chiefly performed. At each side of the condyles, as well exteriorly as interiorly, there is another eminence which gives origin to several muscles of the hand and fingers. Posteriorly and superiorly, speaking with respect to the condyles, we observe a deep fossa which receives a considerable process of the ulna; and anteriorly and opposite to this fossa, we observe another, which is much less and receives another process of the same bone.

The body of the bone has at its upper and anterior part a furrow which begins from behind the head of the bone, and serves to lodge the tendon of a muscle. The body of the os humeri is hollow through its whole length, and, like all other long bones, has its marrow.

This bone is articulated at its upper part to the scapula. This articulation, which allows motion every way, is surrounded by a capsular ligament; that is sometimes torn in luxation, and becomes an obstacle to the easy reduction of the bone. Its lower extremity is articulated with the bones of the fore-arm.

The fore-arm is composed of two bones, the ulna and radius. 50 Of the fore-arm.

The ulna or elbow-bone is much less than the os humeri, and becomes gradually smaller as it descends to the wrist. At its upper part it has two processes, and two cavities. Of the two processes, the largest, which is situated posteriorly, and called the *olecranon*, is admitted into the posterior fossa of the os humeri. The other process is placed anteriorly, and is called the *coronoid process*. In bending the arm it enters into the anterior fossa of the os humeri. This process being 51 Of the ulna.

being much smaller than the other, permits the fore-arm to bend inwards; whereas the olecranon, which is shaped like a hook, reaches the bottom of its fossa in the os humeri as soon as the arm becomes straight, and will not permit the fore-arm to be bent backwards. The ligaments likewise oppose this motion.

Between the two processes we have described, there is a considerable cavity called the sygmoid cavity, divided into two fossæ by a small eminence, which passes from one process to the other; it is by means of this cavity and the two processes, that the ulna is articulated with the os humeri by ginglimus.

At the bottom of the coronoid process interiorly, there is a small sygmoid cavity, which serves for the articulation of the ulna with the radius.

The body of the ulna is of a triangular shape: Its lower extremity terminates by a small head and a little styloid process. The ulna is articulated above to the os humeri—both above and below to the radius, and to the wrist at its lower extremity. All these articulations are secured by means of ligaments. The chief use of this bone seems to be to support and regulate the motions of the radius.

52 Of the radius. The radius, which is so named from its supposed resemblance to the spoke of a wheel, is placed at the inside of the fore-arm. It is somewhat larger than the ulna, but not quite so long as that bone. Its upper part is cylindrical, hollowed superiorly to receive the outer condyle of the os humeri. Laterally it is admitted into the little sygmoid cavity of the ulna, and the cylindrical part of the bone turns in this cavity in the motions of pronation and supination (L). This bone follows the ulna in flexion and extension, and may likewise be moved round its axis in any direction. The lower extremity of the radius is much larger and stronger than its upper part; the ulna, on the contrary, is smaller and weaker below than above; so that they serve to supply each others deficiencies in both those parts.

On the external side of this bone, we observe a small cavity which is destined to receive the lower part of the ulna; and its lower extremity is formed into a large cavity, by means of which it is articulated with the bones of the wrist, and on this account it is sometimes called *manubrium manus*. It supports the two first bones of the wrist on the side of the thumb, whereas the ulna is articulated with that bone of the wrist which corresponds with the little finger.

Through the whole length both of this bone and the ulna, a ridge is observed, which affords attachment to an interosseous ligament. This ligament fills up the space between the two bones.

53. 3. Bones of the Hand.

54 Of the carpus. The carpus or wrist consists of eight small bones of an irregular shape, and disposed in two unequal rows. Those of the upper row are articulated with the bones of the fore-arm, and those of the lower one with the metacarpus.

The ancient anatomists described these bones numerically; Lyserus seems to have been the first who gave to each of them a particular name. The names he adopted are founded on the figure of the bones, and are now pretty generally received, except the first, which instead of κοτυλοειδης (the name given to it by Lyserus, on account of its sinus, that admits a part of the os magnum), has by later writers been named *Scaphoides* or *Naviculare*. This, which is the outermost of the upper row (considering the thumb as the outer side of the hand), is articulated with the radius; on its inner side it is connected with the os lunare, and below to the trapezium and trapezoides. Next to this is a smaller bone called the *os lunare*: because its outer side, which is connected with the scaphoides, is shaped like a crescent. This is likewise articulated with the radius. On its inner side it joins the os cuneiforme, and anteriorly, the os magnum and os unciforme.

The os cuneiform, which is the third bone in the upper row, is compared to a wedge, from its being broader above, at the back of the hand, than it is below. Posteriorly it is articulated with the ulna, and anteriorly with the os unciforme.

These three bones form an oblong articulating surface, covered by cartilage, by which the hand is connected with the fore-arm.

The os pisiforme, or pea-like bone, which is smaller than the three just now described, though generally classed with the bones of the upper row, does not properly belong to either series, being placed on the under surface of the os cuneiforme, so as to project into the palm of the hand. The four bones of the second row correspond with the bones of the thumb and fingers; the first, second, and fourth, are from their shapes named *trapezium*, *trapezoides*, and *unciforme*; the third, from its being the largest bone of the carpus, is styled *os magnum*.

All these bones are convex towards the back, and slightly concave towards the palm of the hand; their articulating surfaces are covered with cartilages, and secured by many strong ligaments, particularly by two ligamentous expansions, called the external and internal annular ligaments of the wrist. The former extends in an oblique direction from the os pisiforme to the styloid process of the radius, and is an inch and an half in breadth; the latter or internal annular ligament is stretched from the os pisiforme and os unciforme, to the os scaphoides and trapezium. These annular ligaments likewise serve to bind down the tendons of the wrist and fingers.

55 Of the metacarpus. The matacarpus consists of four bones, which support the fingers; externally they are a little convex, and internally somewhat concave, where they form the palm of the hand. They are hollow, and of a cylindrical shape.

At each extremity they are a little hollowed for their articulation; superiorly with the bones of the carpus, and inferiorly with the first phalanx of the fingers, in the same manner as the several phalanges of the fingers are articulated with each other.

56 Of the fingers. The five fingers of each hand are composed of fifteen bones, disposed in three ranks called phalanges: The bones of the first phalanx, which are articulated with the

(L) The motions of pronation and supination may be easily described. If the palm of the hand, for instance, is placed in the surface of a table, the hand may be said to be in a state of pronation; but if the back part of the hand is turned towards the table, the hand will be then in a state of supination.

the metacarpus, are the largest, and those of the last phalanx the smallest. All these bones are larger at their extremities than in their middle part.

We observe at the extremities of the bones of the carpus, metacarpus, and fingers, several inequalities that serve for their articulation with each other; and these articulations are strengthened by means of the ligaments which surround them.

It will be easily understood that this multiplicity of bones in the hand (for there are 27 in each hand) is essential to the different motions we wish to perform. If each finger was composed only of one bone instead of three, it would be impossible for us to grasp any thing.

57. § 2. *Of the* Lower Extremities.

Each lower extremity is divided into four parts, viz. the os femoris, or thigh bone: the rotula, or knee-pan; the leg; and the foot.

1. Of the Thigh.

58 Of the os femoris.

The thigh is composed only of this bone, which is the largest and strongest we have. It will be necessary to distinguish its body and extremities: Its body, which is of a cylindrical shape, is convex before and concave behind, where it serves to lodge several muscles. Throughout two-thirds of its length we observe a ridge called *linea aspera*, which originates from the trochanters, and after running for some way downwards, divides into two branches, that terminate in the tuberosities at the lower extremity of the bone.

At its upper extremity we must describe the neck and smooth head of the bone, and likewise two considerable processes: The head, which forms the greater portion of a sphere unequally divided, is turned inwards, and received into the great cotyloid cavity of the os innominatum. At this part of the bone there is a little fossa to be observed, to which the round ligament is attached, and which we have already described as tending to secure the head of this bone in the great acetabulum. The neck is almost horizontal, considered with respect to its situation with the body of the bone. Of the two processes, the external one, which is the largest, is called trochanter major; and the other, which is placed on the inside of the bone, trochanter minor. They both afford attachment to muscles. The articulation of the os femoris with the trunk is strengthened by means of a capsular ligament, which adheres every where round the edge of the great cotyloid cavity of the os innominatum, and surrounds the head of the bone.

The os femoris moves upon the trunk in every direction.

At the lower extremity of the bone are two processes called the condyles, and an intermediate smooth cavity, by means of which it is articulated with the leg by ginglimus.

All round the under end of the bone there is an irregular surface where the capsular ligament of the joint has its origin, and where blood-vessels go into the substance of the bone.

Between the condyles there is a cavity posteriorly, in which the blood-vessels and nerves are placed, secure from the compression to which they would otherwise be exposed in the action of bending the leg, and which would not fail to be hurtful.

At the side of each condyle externally, there is a tuberosity, from whence the lateral ligaments originate, which are extended down the tibia.

A ligament likewise arises from each condyle posteriorly. One of these ligaments passes from the right to the left, and the other from the left to the right, so that they intersect each other, and for that reason are called the *cross ligaments*.

The lateral ligaments prevent the motion of the leg upon the thigh to the right or left; and the cross ligaments, which are also attached to the tibia, prevent the latter from being brought forwards.

In new-born children all the processes of this bone are cartilaginous.

2. The Rotula, or Knee-pan.

59 Of the rotula.

The rotula, patella, or knee-pan, as it is differently called, is a flat bone about four or five inches in circumference, and is placed at the fore-part of the joint of the knee. In its shape it is somewhat like the common figure of the heart, with its point downwards.

It is thinner at its edge than in its middle part; at its fore-part it is smooth and somewhat convex; its posterior surface, which is more unequal, affords an elevation in the middle which is admitted between the two condyles of the os femoris.

This bone is retained in its proper situation by a strong ligament which every where surrounds it, and adheres both to the tibia and os femoris; it is likewise firmly connected with the tibia by means of a strong tendinous ligament of an inch in breadth, and upwards of two inches in length, which adheres to the lower part of the patella, and to the tuberosity at the upper end of the tibia. On account of this connection, it is very properly considered as an appendage to the tibia, which it follows in all its motions, so as to be to it what the olecranon is to the ulna. There is this difference, however, that the olecranon is a fixed process; whereas the patella is moveable, being capable of sliding from above downwards and from below upwards. This mobility is essential to the rotatory motion of the leg.

In very young children this bone is entirely cartilaginous.

The principal use of the patella seems to be to defend the articulation of the knee from external injury; it likewise tends to increase the power of the extensor muscles of the leg, by removing their direction farther from the centre of motion in the manner of a pulley.

3. Of the Leg. 60.

The leg is composed of two bones: Of these the inner one, which is the largest, is called tibia; the other is much smaller, and named fibula.

61 Of the tibia.

The tibia, which is so called from its resemblance to the musical pipe of the ancients, has three surfaces, and is not very unlike a triangular prism. Its posterior surface is the broadest; anteriorly it has a considerable ridge called the shin, between which and the skin there are no muscles. At the upper extremity of this bone are two surfaces, a little concave, and separated from each other by an intermediate elevation. The two little cavities receive the condyles of the os femoris, and the eminence between them is admitted into the cavity which we spoke of as being between the two condyles; so that this articulation affords a specimen of the complete

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At the lower and inner portion of the tibia, we observe a considerable process called *malleolus internus*. The basis of the bone terminates in a large transverse cavity, by which it is articulated with the uppermost bone of the foot. It has likewise another cavity at its lower end and outer side, which is somewhat oblong, and receives the lower end of the fibula.

62 The tibia is hollow through its whole length.

Of the fibula. The fibula is a small long bone situated on the outside of the tibia. Its superior extremity does not reach quite so high as the upper part of the tibia, but its lower end descends somewhat lower. Both above and below, it is articulated with the tibia by means of the lateral cavities we noticed in our description of that bone.

Its lower extremity is stretched out into a coronoid process, which is flattened at its inside, and its convex externally, forming what is called the *malleolus externus*, or *outer ancle*. This is rather lower than the malleolus internus of the tibia.

The body of this bone, which is irregularly triangular, is a little hollow at its internal surface, which is turned towards the tibia, and it affords like that bone, through its whole length, attachment to a ligament, which from its situation is called the interosseous ligament,

63. 4. Of the Foot.

64 The foot consists of the tarsus, metatarsus, and toes.

Of the tarsus. The tarsus is composed of seven bones, viz. the astragalus, os calcis, os naviculare, os cuboides, and three others called cuneiform bones.

65 Of the astragalus. The astragalus is a large bone with which both the tibia and fibula are articulated. It is the uppermost bone of the foot; it has several surfaces to be considered; its upper, and somewhat posterior part, which is smooth and convex, is admitted into the cavity of the tibia. Its lateral parts are connected with the malleoli of the two bones of the leg; below, it is articulated with the os calcis, and its anterior surface is received by the os naviculare. All these articulations are secured by means of ligaments.

66 Of the os calcis. The os calcis, or calcaneum, which is of a very irregular figure, is the largest bone of the foot. Behind, it is formed into a considerable tuberosity called the heel; without this tuberosity, which supports us in an erect posture, and when we walk, we should be liable to fall backwards.

On the internal surface of this bone, we observe a considerable sinuosity, which affords a passage to the tendon of a muscle: and to the posterior part of the os calcis, a strong tendinous cord called the *tendo achillis* (M) is attached, which is formed by the tendons of several mucles united together. The articulation of this with the other bones is secured by means of ligaments.

67 Of the os naviculare. Theos naviculare, or scaphoides, (for these two terms have the same signification), is so called on account of its resemblance to a little bark. At its posterior part, which is concave, it receives the astragalus; anteriorly it is articulated with the cuneiform bones, and laterally it is connected with the os cuboides. Osteology.

The os cuboides forms an irregular cube. Posteriorly it is articulated with the os calcis; anteriorly it supports the two last bones of the metatarsus, and laterally it joins the third cuneiform bone and the os naviculare. 68 Of the os cuboides.

Each of the ossa cuneiformia, which are three in number, resembles a wedge, and from this similitude their name is derived. They are placed next to the metatarsus by the sides of each other, and are usually distinguished into *os cuneiforme externum. medium* or *minimum*, and *internum* or *maximum*. The superior surface of these bones, from their wedge-like shape, is broader than that which is below, where they help to form the sole of the foot; posteriorly they are united to the os naviculare, and anteriorly they support the three first metatarsal bones. 69 Of the ossa cuneiformia.

When these seven bones composing the tarsus are viewed together in the skeleton, they appear convex above, where they help to form the upper part of the foot; and concave underneath, where they form the hollow of the foot, in which the vessels, tendons, and nerves of the foot are placed secure from pressure.

They are united to each other by very strong ligaments, and their articulation with the foot is secured by a capsular and two lateral ligaments; each of the latter is covered by an annular ligament of considerable breadth and thickness, which serves to bind down the tendons of the foot, and at the same time to strengthen the articulation.

The os cuneiforme externum is joined laterally to the os cuboides.

These bones complete our account of the tarsus. Though what we have said of this part of the osteology has been very simple and concise, yet many readers may not clearly understand it: but if they will be pleased to view these bones in their proper situation in the skeleton, all that we have said of them will be easily understood.

The metatarsus is made up of five bones, whereas the metacarpus consists only of four. The cause of this difference is, that in the hand the last bone of the thumb is not included among the metacarpal bones; whereas in the foot the great toe has only two bones. The first of these bones supports the great toe and is much larger than the rest, which nearly resemble each other in size. 70 Of the metatarsus.

These bones are articulated by one extremity with the cuneiform bones and the os cuboides, and by their other end with the toes.

Each of the toes, like the fingers, consists of three bones, except the great toe, which is formed of two bones. Those of the other four are distinguished into three phalanges. Although the toes are more confined in their motion than the fingers, yet they appear to be perfectly fitted for the purposes they are designed for. In walking, the toes bring the centre of gravity perpendicular to the advanced foot; and as the soles of the feet are naturally concave, we can at pleasure increase this concavity, and form a kind of vault, which adjusts itself to the different inequalities that occur 71 Of the toes.

(M) This tendon is sometimes ruptured by jumping, dancing, or other violent efforts.

Osteology. cur to us in walking; and which, without this mode of arrangement would incommode us exceedingly, especially when bare-footed.

72. § 4. *Of the Ossa* Sesamoidea.

Besides the bones we have already described, there are several small ones that are met with only in the adult skeleton, and in persons who are advanced in life; which, from their supposed general resemblance to the seeds of the sesamum, are called *ossa sesamoidea*. They are commonly to be seen at the first joint of the great toe, and sometimes at the joints of the thumb; they are likewise now and then to be found at the lower extremity of the fibula, upon the condyles of the thigh-bone, under the os cuboides of the tarsus, and in other parts of the body. Their size and number seem constantly to be increased by age and hard labour; and as they are generally found in situations where tendons and ligaments are most exposed to the action of muscles, they are now generally considered as ossified portions of ligaments or tendons.

The upper surface of these bones is usually convex, and adherent to the tendon that covers it; the side which is next to the joint is smooth and flat. Though their formation is accidental, yet they seem to be of some use, by raising the tendons farther from the centre of motion, and consequently increasing the power of the muscles. In the great toe and thumb they are likwise useful, by forming a groove for the flexor tendons.

EXPLANATION of the PLATES of OSTEOLOGY.

Plate XIX.

Fig. 1. A Front-view of the Male Skeleton.

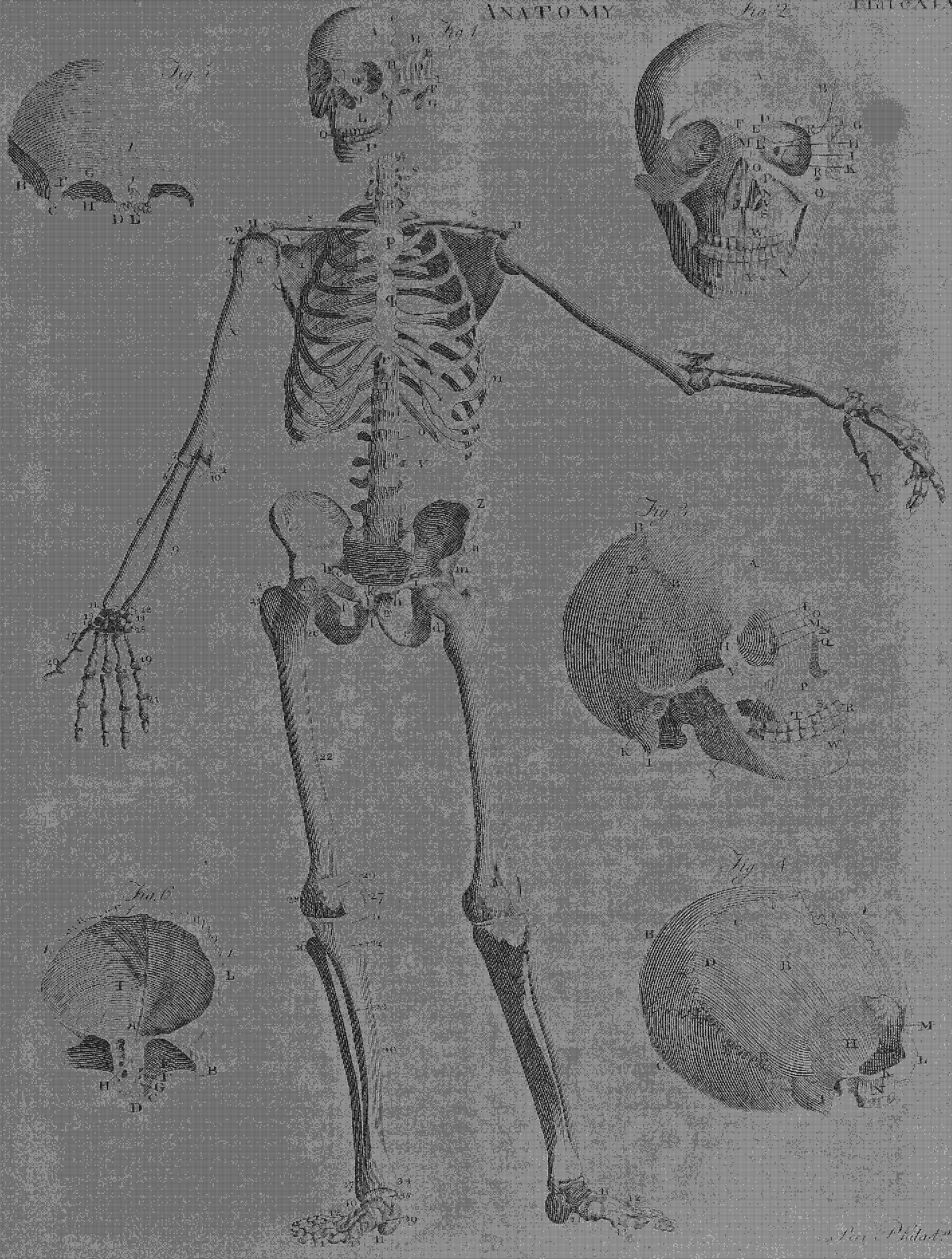
A, The os frontis. B, The os parietale. C, The coronal suture. D, The squamous part of the temporal bones. E, The squamous suture. F, The zygoma. G, The mastoid process. H, The temporal process of the sphenoid bone. I, The orbit. K, The os malæ. L, The os maxillare superius. M, Its nasal process. N, The ossa nasi. O, The os unguis. P, the maxilla inferior. Q, The teeth, which are sixteen in number in each jaw. R, The seven cervical vertebræ, with their intermediate cartilages. S, Their transverse processes. T, The twelve dorsal vertebræ, with their intermediate cartilages. U, The five lumbar vertebræ. V, Their transverse processes. W, The upper part of the os sacrum. X, Its lateral parts. The holes seen on its fore part are the passages of the undermost spinal nerves and small vessels. Opposite to the holes, the marks of the original divisions of the bone are seen. Y, The os ilium. Z, Its crest or spine. a, The anterior spinous processes. b, The brim of the pelvis. c, The ischiatic niche. d, The os ischium. e, Its tuberosity. f, Its spinous process. g, Its crus. h, The foramen thyroideum. i, The os pubis. k, The symphysis pubis. l, The crus pubis. m, The acetabulum. n, The seventh or last true rib. o, The twelfth or last false rib. y, The upper end of the sternum. q. The middle piece. r, The under end, or cartilage ensiformis. s, The clavicle. t, The internal surface of the scapula. u, Its acromion. v, Its coracoid process. w, Its cervix. x, The glenoid cavity. y, The os humeri. z, Its head, which is connected to the glenoid cavity. 1, Its external tubercle. 2, Its internal tubercle. 3, The groove for lodging the long head of the biceps muscle of the arm. 4, The internal condyle. 5, The external condyle. Between 4 and 5, the trochlea. 6, The radius. 7, Its head. 8, Its tubercle. 9, The ulna. 10, Its coronoid process. 11, 12, 13, 14, 15, 16, 17, 18, The carpus; composed of os naviculare, os lunare, os cuneiforme, os pisiforme, os trapezium, os trapezoides, os magnum, os unciforme. 19, The five bones of the metacarpus. 20, The two bones of the thumb. 21, The three bones of each of the fingers. 22, The os femoris. 23, Its head. 24, Its cervix. 25, The trochanter major. 26, The trochanter minor. 27, The internal condyle. 28, The external condyle. 29, The rotula. 30, The tibia. 31, Its head. 32, Its tubercle. 33, Its spine. 34, The malleolus internus. 35, The fibula. 36, Its head. 37, The malleolus externus. The tarsus is composed of, 38, The astragalus; 39, The os calcis; 40, The os naviculare; 41, Three ossa cuneiformia, and the os cuboides, which is not seen in this figure. 42, The five bones of the metatarsus. 43, The two bones of the great toe. 44, The three bones of each of the small toes.

Fig. 2. A Front-view of the Skull.

A, The os frontis. B, the lateral part of the os frontis, which gives origin to part of the temporal muscle. C, The superciliary ridge. D, The superciliary hole through which the frontal vessels and nerves pass. EE, The orbitar processes. F, The middle of the transverse suture, G, The upper part of the orbit. H, The foramen opticum. I, The foramen lacerum. K, The inferior orbitar fissure. L, The os unguis. M, The ossa nasi. N, The os maxillare superius. O, Its nasal process. P, The external orbitar hole through which the superior maxillary vessels and nerves pass. Q, The os malæ. R, A passage for small vessels into, or out of, the orbit. S, The under part of the left nostril. T, The septum narium. U, The os spongiosum superius. V, The os spongiosum inferius. W, The edge of the alveoli, or spongy sockets, for the teeth. X, the maxilla inferior. Y, The passage for the inferior maxillary vessels and nerves.

Fig. 3. A Side-view of the Skull.

A, The os frontis. B, The coronal suture. C, The os parietale. D, An arched ridge which gives origin to the temporal muscle. E, The squamous suture. F, The squamous part of the temporal bone: and farther forwards, the temporal process of the sphenoid bone. G, The zygomatic process of the temporal bone. H, The zygomatic suture. I, The mastoid process of the temporal bone. L, The meatus auditorius externus. L, The orbitar plate of the frontal bone, under which is seen the tranverse suture. M, The pars plana of the ethmoid bone. N, The os unguis. O, The right os nasi. P, The superior maxillary bone. Q, Its nasal process. R, The two dentes incisores. S, The dens caninus. T, The two small molares. U, The three large molares. V, The os malæ. W, The lower jaw. X, Its angle. Y, The, coronoid



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Osteology.

coronoid process. Z, The condyloid process, by which the jaw is articulated with the temporal bone.

FIG. 4. The posterior and right side of the SKULL.

A, The os frontis. B B, The ossa parietalia. C, The sagittal suture. D, the parietal hole, through which a small vein runs to the superior longitudinal sinus. E, The lambdoid suture. F F, Ossa triquetra. G, The os occipitis. H, The squamous part of the temporal bone. I, The mastoid process. K, The zygoma. L, The os malæ. M, The temporal part of the sphenoid bone. N, The superior maxillary bone and teeth.

FIG. 5. The external Surface of the OS FRONTIS.

A, The convex part. B, Part of the temporal fossa. C, The external angular process. D, The internal angular process. E, The nasal process. F, The superciliary arch. G, The superciliary hole. H, The orbitar plate.

FIG. 6. The Internal Surface of the OS FRONTIS.

A A, The serrated edge which assists to form the coronal suture. B, The external angular process. C, The internal angular process. D, The nasal process. E, The orbitar plate. F, The cells which correspond with those of the ethmoid bone. G, The passage from the frontal sinus. H, The opening which receives the cribriform plate of the ethmoid bone. I, The cavity which lodges the fore part of the brain. K, The spine to which the falx is fixed. L, The groove which lodges the superior longitudinal sinus.

PLATE XX.

FIG. 1. A back view of the SKELETON.

A A, The ossa parietalia. B, The sagittal suture. C, The lambdoid suture. D, The occipital bone. E, The squamous suture. F, The mastoid process of the temporal bone. G, The os malæ. H, The palate plates of the superior maxillary bones. I, The maxilla inferior. K, The teeth of both jaws. L, The seven cervical vertebræ. M, Their spinous processes. N, Their transverse and oblique processes. O, The last of the twelve dorsal vertebræ. P, The fifth or last lumbar vertebra. Q, The transverse processes. R, The oblique processes. S, The spinous processes. T, The upper part of the os sacrum. U, The posterior holes which transmit small blood-vessels and nerves. V, The under part of the os sacrum which is covered by a membrane. W, The os coccygis. X, The os ilium. Y, Its spine or crest. Z, The ischiatic niche. a, The os ischium. b, Its tuberosity. c, Its spine. d, The os pubis. e, The foramen hydroideum. f, The seventh or last true rib. g, The twelfth or last false rib. h, The clavicle. i, The scapula. k, Its spine. l, Its acromion. m, Its cervix. n, Its superior costa. o, Its posterior costa. p, Its inferior costa. q, The os humeri. r, The radius. s, The ulna. t, Its olecranon. u, All the bones of the carpus, excepting the os pisiforme, which is seen in Plate XIX. fig. 1. v, The five bones of the matacarpus. w, The two bones of the thumb. x, The three bones of each of the fingers. y, The two sesamoid bones at the root of the left thumb. z, The os femoris. 1, The trochanter major. 2, The trochanter minor. 3, The linea aspera. 4, The internal condyle. 5, The external condyle. 6 6, The similunar cartilages. 7, The tibia. 8, The malleolus internus. 9, The fibula. 10, The malleolus externus. 11, The tarsus. 12, The metatarsus. 13, The toes.

FIG. 2. The External Surface of the Left OS PARIETALE.

A, The convex smooth surface. B, The parietal hole. C, An arch made by the beginning of the temporal muscle.

FIG. 3. The internal surface of the same bone.

A, Its superior edge, which, joined with the other, forms the sagittal suture. B, The anterior edge, which assists in the formation of the coronal suture. C, The inferior edge for the squamous suture. D, The posterior edge for the lambdoid suture. E, A depression made by the lateral sinus. F F, The prints of the arteries of the dura mater.

FIG. 4. The External Surface of the Left OS TEMPORUM.

A, The squamous part. B, The mastoid process. C The zygomatic process. D, The styloid process. E, The petrosal process. F, The meatus auditorius externus. G, The glenoid cavity for the articulation of the lower jaw. H, The foramen stylo-mastoideum for the portio dura of the seventh pair of nerves. I, Passages for blood-vessels into the bone. K, The foramen mastoideum through which a vein goes to the lateral sinus.

FIG. 5. The Internal surface of the Left OS TEMPORUM.

A, The squamous part; the upper edge of which assists in forming the squamous suture. B, The mastoid process. C, The styloid process. D, The pars petrosa. E, The entry of the seventh pair, or auditory nerve. F, The fossa, which lodges a part of the lateral sinus. G, The foramen mastoideum.

FIG. 6. The External Surface of the OSSEOUS CIRCLE, which terminates the meatus auditorius externus.

A, The anterior part. B, A small part of the groove in which the membrana tympani is fixed.

N. B. This, with the subsequent bones of the ear, are here delineated as large as the life.

FIG. 7. The Internal Surface of the OSSEOUS CIRCLE.

A, The anterior part. B, The groove in which the membrana tympani is fixed.

FIG. 8. The Situation and Connection of the Small Bones of the EAR.

A, The malleus. B, The incus. C, The os orbiculare. D, The stapes.

FIG. 9. The MALLEUS, with its Head, Handle, and Small Processes.

FIG. 10. The INCUS, with its Body, Superior and Inferior Branches.

FIG 11. The OS OBRICULARE.

FIG. 12. The STAPES, with its Head, Base, and two Crura.

FIG. 13. An Internal View of the LABYRINTH of the EAR.

A, The hollow part of the cochlea, which forms a share

ſhare of the meatus auditorius internus. B, The veſtibulum. C C C, The ſemicircular canals.

FIG. 14. An External View of the LABYRINTH.

A, the ſemicircular canals. B, The feneſtra ovalis which leads into the veſtibulum. C, The feneſtra rotunda which opens into the cochlea. D, The different turns of the cochlea.

FIG. 15. The Internal Surface of the Os SPHENOIDES.

A A, The temporal proceſſes. B B, The pterygoid proceſſes. C C, The ſpinous proceſſes. D D, The anterior clinoid proceſſes. E. The poſterior clinoid proceſs. F, The anterior proceſs which joins the ethmoid bone. G, the ſella turcica for lodging the glandula pituitaria. H, The foramen opticum. K, The foramen lacerum. L, The foramen rotundum. M, The foramen ovale. N, The foramen ſpinale.

FIG. 16. The External Surface of the Os SPHENOIDES.

A A, The temporal proceſſes. B B, The pterygoid proceſſes. C C, The ſpinous proceſſes. D, The proceſſus azygos. E, The ſmall triangular proceſſes which grow from the body of the bone. F F, The orifices of the ſphenoidal ſinuſes. G, The foramen lacerum. H, The foramen rotundum. I, The foramen ovale. K, The foramen pterygoideum.

FIG. 17. The External View of the Os ETHMOIDES.

A, The naſal lamella. B B, The grooves between the naſal lamella and oſſa ſpongioſa ſuperiora. C C, The oſſa ſpongioſa ſuperiora. D D, The ſphenoidal cornua. See Fig. 16. E.

FIG. 18. The Internal View of the Os ETHMOIDES.

A, The criſta galli. B, The cribriform plate, with the different paſſages of the olfactory nerves. C C, Some of the ethmoidal cells. D, The right os planum. E E, The ſphenoidal cornua.

FIG. 19. The right SPHENOIDAL CORNU.

FIG. 20. The left SPHENOIDAL CORNU.

FIG. 21. The External Surface of the Os OCCIPITIS.

A, The upper part of the bone. B, The ſuperior arched ridge. C, The inferior arched ridge. Under the arches are prints made by the muſcles of the neck. DD, The two condyloid proceſſes which articulate the head with the ſpine. E, The cuneiform proceſs. F, The foramen magnum through which the ſpinal marrow paſſes. GG, The poſterior condyloid foramina which tranſmit veins into the lateral ſinuſes. HH, The foramina lingualia for the paſſage of the nine pair of nerves.

FIG. 22. The internal Surface of the Os OCCIPITIS.

A A, The two ſides which aſſiſt to form the lambdoid ſuture. B, The point of the cuneiform proceſs, where it joins the ſphenoid bone. C C, The prints made by the poſterior lobes of the brain. D D, Prints made by the lobes of the cerebellum. E, The cruciform ridge for the attachment of the proceſſes of the dura mater. F, The courſe of the ſuperior longitudinal ſinuſes. G G, The courſe of the two lateral ſinuſes. H, The foramen magnum. I I, The poſterior condyloid foramina.

PLATE XXI.

FIG. 1. A Side-view of the SKELETON.

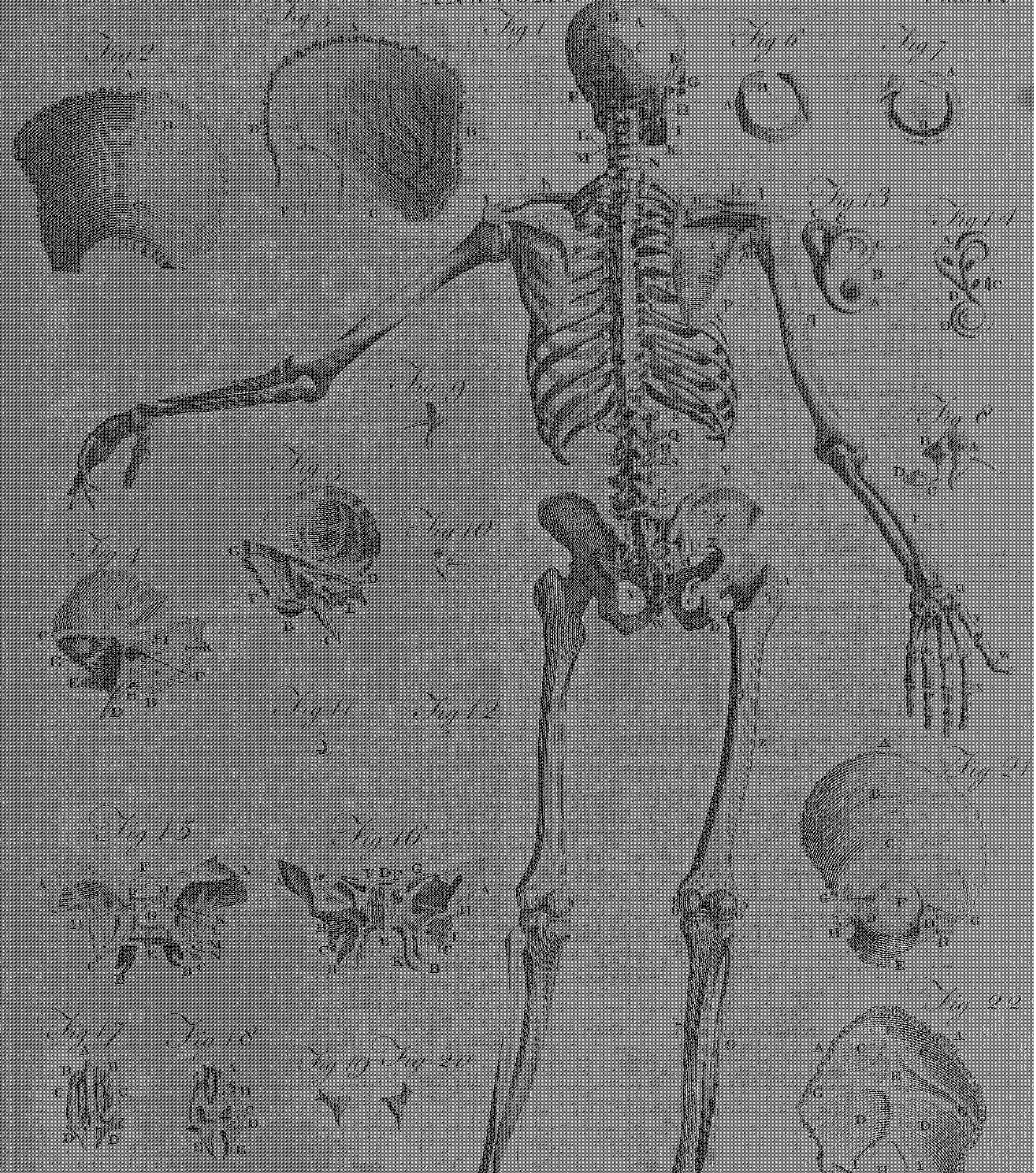
A A, The oſſa parietalia. B, the ſagittal ſuture. C, The os occipitis. D D, The lambdoid ſuture. E, The ſquamous part of the temporal bone. F, The maſtoid proceſs. G, The meatus auditorius externus. H, The os frontis. I, The os malæ. K, The os maxillare ſuperius. L, The maxilla inferior. M, The teeth of both jaws. N, The ſeventh, or laſt cervical vertebra. O, The ſpinous proceſſes. P, Their tranſverſe and oblique proceſſes. Q, The twelfth or laſt dorſal vertebra. R, The fifth, or laſt lumbar vertebra. S. The ſpinous proceſſes. T, Openings between the vertebræ for the paſſage of the ſpinal nerves. U, The under end of the os ſacrum. V, The os coccygis. W, The os ilium. X, The anterior ſpinous proceſſes. Y, The poſterior ſpinous proceſſes. Z, The iſchiatic niche. a, The right os ilium. b, The oſſa pubis. c, The tuberoſity of the left os iſchium. d, The ſcapula. e, Its ſpine. f, The os humeri. g, The radius. h, The ulna. i, The carpus. k, The metacarpal bone of the thumb. l, The metacarpal bones of the fingers. m, The two bones of the thumb. n, The three bones of each of the fingers. o, The os femoris. p, Its head. q, The trochanter major. r, The external condyle. s, The rotula. t, The tibia, u, The fibula. v, The malleolus externus. w, The aſtragalus. x, The os calcis. y, The os naviculare, z, The three oſſa cuneiformia. 1, The os cuboides. 2, The five metatarſal bones. 3, The two bones of the great toe. 4, The three bones of each of the ſmall toes.

FIG. 2. A View of the Internal Surface of the Baſe of the SKULL.

A A A, The two tables of the ſkull with the diploe. B B, The orbitar plates of the frontal bone. C, The criſta galli, with cribriform-plate of the ethmoidal bones on each ſide of it, through which the firſt pair of nerves paſs. D, The cuneiform proceſs of the occipital bone. E, The cruciform ridge. F, The foramen magnum for the paſſage of the ſpinal marrow. G, The zygoma, made by the joining of the zygomatic proceſſes of the os temporum and os malæ. H, The pars ſquamoſa of the os temporum. I, The pars mammillaris. K, The pars petroſa. L, The temporal proceſs of the ſphenoid bone. M M, The anterior clinoid proceſſes. N, The poſterior clinoid proceſs. O, The ſella turcica. P, The foramen opticum, for the paſſage of the optic nerve and ocular artery of the left ſide. Q, The foramen lacerum, for the third, fourth, ſixth, and firſt of the fifth pair of nerves and ocular vein. R, The foramen rotundum, for the ſecond of the fifth pair. S, The foramen ovale, for the third of the fifth pair. T, The foramen ſpinale, for the principal artery of the dura mater. U, The entry of the auditory nerve. V, The paſſage for the lateral ſinus. W, The paſſage of the eighth pair of nerves. X, The paſſage of the ninth pair.

FIG. 3. A View of the External Surface of the Baſe of the SKULL.

A, The two dentes inciſores of the right ſide. B, The dens caninus. C, The two ſmall molares. D, The three large molares. E, The foramen inciſivum, which gives paſſage to ſmall blood-veſſels and nerves. F, The palate-



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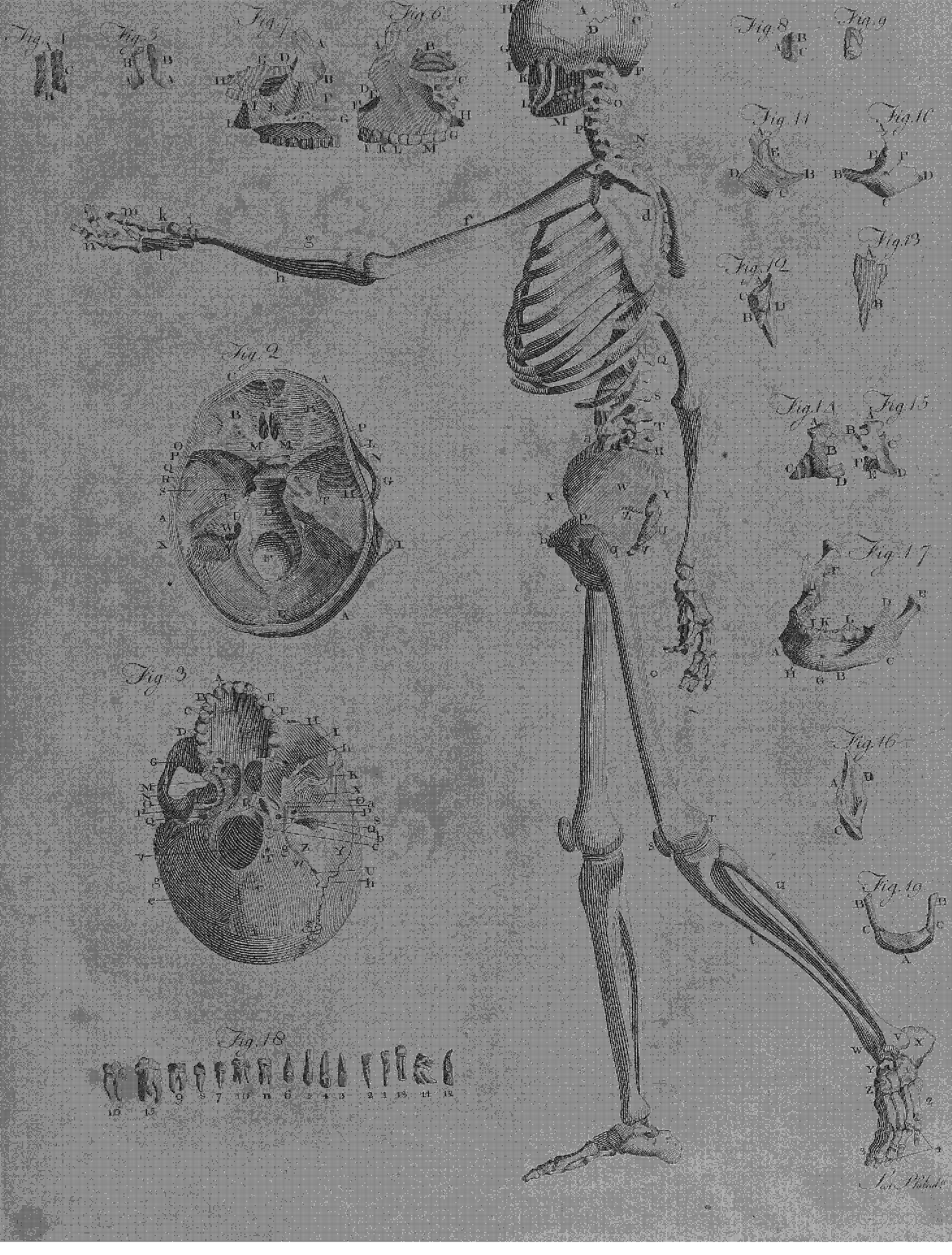
Fig. 1
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Fig. 18
Fig. 19

Osteology. palate-plates of the offa maxillaria and palati, joined by the longitudinal and tranfverfe palate futures. G, The foramen palatinum pofterius, for the palatine veffels and nerves. H, The os maxillare fuperius of the right fide. I, The os malæ. K, The zygomatic procefs of the temporal bone. L, The pofterior extremity of the offa fpongiofa. M, The pofterior extremity of the vomer, which forms the back-part of the feptum nafi. N, The pterygoid procefs of the right fide of the fphenoid bone. OO, The formina ovalia. PP, The foramina fpinalia. QQ, The paffages of the internal carotid arteries. R, A hole between the point of each pars petrofa and cuneiform procefs of the occipital bone, which is filled up with a ligamentous fubftance in the recent fubject. S, The paffage of the left lateral finus. T, The pofterior condyloid foramen of the left fide. U, The foramen maftoideum. V, The foramen magnum. W, The inferior orbitar fiffure. X, The glenoid cavity, for the articulation of the lower jaw. Y, The fquamous part of the temporal bone. Z, The maftoid procefs, at the inner fide of which is a foffa for the pofterior belly of the digaftric mufcle. a, The ftyloid procefs. b, The meatus auditorius externus. c, The left condyle of the occipital bone. d, The perpendicular occipital fpine. e e, The inferior horizontal ridge of the occipital bone. f f, The fuperior horizontal ridge, which is oppofite to the crucial ridge where the longitudinal finus divides to form the lateral finufes. g g g, The lambdoid future. h, The left fquamous future. i, The parietal bone.

Fig. 4. The anterior furface of the Ossa Nasi.

A, The upper part, which joins the os frontis. B, The under end, which joins the cartilage of the nofe. C, The inner edge, where they join each other.

Fig. 5. The pofterior furface of the Ossa Nasi.

AA, Their cavity, which forms part of the arch of the nofe. B B, Their ridge or fpine, which projects a little to be fixed to the fore-part of the feptum narium.

Fig. 6. The external furface of the Os Maxillare Superius of the left fide.

A, The nafal procefs. B, The orbitar plate. C, The unequal furface which joins the os malæ. D, The external orbitar hole. E, The opening into the noftril. F, The palate-plate. G, The maxillary tuberofity. H, part of the os palati. I, The two dentes incifores. K, The dens caninus. L, The two fmall dentes molares. M, The three large dentes molares.

Fig. 7. The internal furface of the Os Maxillare Superius and Os Palati.

A, The nafal procefs. BB, Eminences for the connection of the os fpongiofum inferius. D, The under end of the lachrymal groove. E, The antrum maxillare. F, The nafal fpine, between which and B is the cavity of the noftril. G, The palate-plate. H, The orbitar part of the os palati. I, The nafal plate. K, The future which unites the maxillary and palate hones. L, The pterygoid procefs of the palate bone.

Fig. 8. The external furface of the right Os Unguis.

A, The orbitar part. B, The lachrymal part. C, The ridge between them.

Fig. 9. The internal furface of the right Os Unguis. Osteology.

This fide of the bone has a furrow oppofite to the external ridge; all behind this is irregular, where it covers part of the ethmoidal cells.

Fig. 10. The external furface of the left Os Malæ.

A, The fuperior orbitar procefs. B, The inferior orbitar procefs. C, The malar procefs. D, The zygomatic procefs. E, The orbitar plate. F, A paffage for fmall veffels into or out of the orbit.

Fig. 11. The internal furface of the left Os Malæ.

A, The fuperior orbitar procefs. B, The inferior orbitar procefs. C, The malar procefs. D, The zygomatic procefs. E, The internal orbitar plate or procefs.

Fig. 12. The external furface of the right Os Spongiosum Inferius.

A, The anterior part. B, The hook-like procefs for covering part of the antrum maxillare. C, A fmall procefs which covers part of the under end of the lachrymal groove. D, The inferior edge turned a little outwards.

Fig. 13. The internal furface of the Os Spongosium Inferius.

A, The anterior extremity. B, The upper edge which joins the fuperior maxillary and palate bones.

Fig. 14. The pofterior and external furface of the right Os Palati.

A, The orbitar procefs. B, The nafal lamella. C, The pterygoid procefs. D, The palate procefs.

Fig. 15. The interior and external furface of the right Os Palati.

A, The orbitar procefs. B, An opening through which the lateral nafal veffels and nerves pafs. C, The nafal lamella. D, The pterygoid procefs. E, The pofterior edge of the palate procefs for the connection of the velum palati. F, The inner edge by which the two offa palati are connected.

Fig. 16. The right fide of the Vomer.

A, The upper edge which joins the nafal lamella of the ethmoid bone and the middle cartilage of the nofe. B, The inferior edge, which is connected to the fuperior maxillary and palate bones. C, The fuperior and pofterior part which receives the proceffus azygos of the fphenoid bone.

Fig. 17. The Maxilla Inferior.

A, The chin. B, The bafe and left fide. C, The angle. D, The coronoid procefs. E, The condyloid procefs. F, The beginning of the inferior maxillary canal of the right fide, for the entry of the nerve and blood-veffels. G, The termination of the left canal. H, The two dentes incifores. I, The dens caninus. K, The two fmall molares. L, The three large molares.

Fig. 18. The different claffes of the Teeth.

1, 2, A fore and back view of the two anterior dentes incifores of the lower jaw. 3, 4, Similar teeth of the upper jaw. 5, 6, A fore and back view of the dentes canini. 7, 8, The anterior dentes molares. 9, 10, 11, The pofterior dentes molares. 12, 13, 14,

15,

Osteology. 15, 16, Unusual appearances in the shape and size of the teeth.

Fig. 19. The external surface of the Os Hyoides.

A, The body. B B, The cornua. C C, The appendices.

Plate XXII.

Fig. 1. A Posterior View of the Sternum and Clavicles, with the ligament connecting the clavicles to each other.

a, The posterior surface of the sternum. bb, The broken ends of the clavicles. c c c c, The tubercles near the extremity of each clavicle. d, The ligament connecting the clavicles.

Fig. 2. A Fore-view of the Left Scapula, and of a half of the Clavicle, with their Ligaments.

a, The spine of the scapula. b, The acromion. c, The inferior angle. d, Inferior costa. e, Cervix. f, Glenoid cavity, covered with cartilage for the arm-bone. g g, The capsular ligament of the joint. h, Coracoid process. i, The broken end of the clavicle. k, Its extremity joined to the acromion. l, A ligament coming out single from the acromion to the coracoid process. m, A ligament coming out single from the acrominon, and dividing into two, which are fixed to the coracoid process.

Fig. 3. The Joint of the elbow of the Left Arm, with the Ligaments.

a, The os humeri. b, Its internal condyle. c c, The two prominent parts of its trochlea appearing through the capsular ligament. d, The ulna. e, The radius, f, The part of the ligament including the head of the radius.

Fig. 4. The Bones of the Right-Hand, with the Palm in view.

a, The radius. b, The ulna. c, The scaphoid bone of the carpus. d, The os lunare. e, The os cuneiforme. f, The os pisiforme. g, Trapezium. h, Trapezoides. i, Capitatum. k. Unciforme. l, The four metacarpal bones of the fingers. m, The first phalanx. n, The second phalanx. o, The third phalanx. p, The metacarpal bone of the thumb. q, The first joint. r, The second joint.

Fig. 5. The Posterior View of the Bones of the Left Hand.

The explication of Fig. 4. serves for this figure; the same letters pointing out the same bones, though in a different view.

Fig. 6. The Upper Extremity of the Tibia, with the Semilunar Cartilages of the Joint of the Knee, and some Ligaments.

a, The strong ligament which connects the rotula to the tubercle of the tibia. b b, The parts of the extremity of the tibia, covered with cartilage, which appear within the semilunar cartilages. c c, The semilunar cartilages. d, The two parts of what is called the cross ligament.

Fig 7. The Posterior View of the Joint of the Right Knee.

a, The os femoris cut. b, Its internal condyle. c, Its external condyle. d, The back-part of the tibia. e, The superior extremity of the fibula. f, The edge of the internal semilunar cartilage. g, An oblique ligament. h, A larger perpendicular ligament. i, A ligament connecting the femur and fibula.

Fig. 8. The Anterior View of the Joint of the Right Knee.

b, The internal condyle. c, Its external condyle. d, The part of the os femoris, on which the patella moves. e, A perpendicular ligament. f f, The two parts of the crucial ligaments. g g, The edges of the two moveable semilunar cartilages. h, The tibia. i, The strong ligament of the patella. k, The back part of it where the fat has been dissected away. l, The external depression. m, The internal one. n, The cut tibia.

Fig. 9. A View of the inferior part of the Bones of the Right Foot.

a, The great knob of the os calcis. b, A prominence on its outside. c, The hollow for the tendons, nerves, and blood-vessels. d, The anterior extremity of the os calcis. e, Part of the astragalus. f, Its head covered with cartilage. g, The internal prominence of the os naviculare. h, The os cuboides. i, The os cuneiforme internum; k,—Medium; l,—Externum. m, The metatarsal bones of the four lesser toes. n, The first—o, The second—p, The third phalanx of the four lesser toes. q, The metatarsal bones of the great toe. r, Its first—s, Its second joint.

Fig. 10. The Inferior Surface of the two large Sesamoid Bones, at the first joint of the Great Toe.

Fig. 11. The Superior View of the Bones of the Right Foot.

a, b, as in Fig. 9. c, The superior head of the astragalus. d, *&c.* as in Fig. 9.

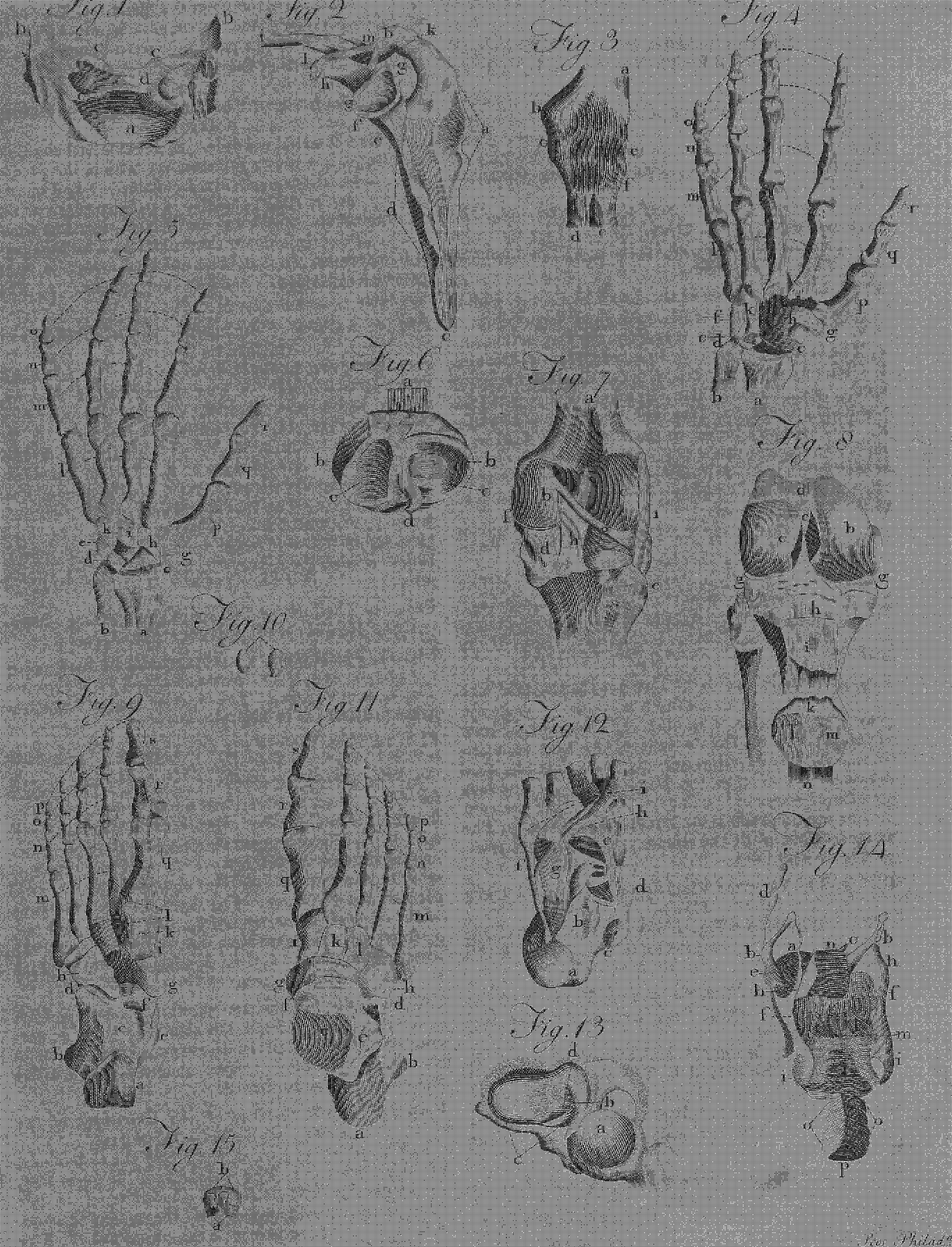
Fig. 12. The View of the Sole of the Foot, with its Ligaments.

a, The great knob of the os calcis. b, The hollow for the tendons, nerves, and blood-vessels. c, The sheaths of the flexores pollicis and digitorum longi opened. d, The strong cartilaginous ligament supporting the head of the astragalus. e, h, Two ligaments which unite into one, and are fixed to the metatarsal bone of the great toe. f, A ligament from the knob of the os calcis to the metatarsal bone of the little toe. g, A strong triangular ligament, which supports the bones of the tarsus. i, The ligaments of the joints of the five metatarsal bones.

Fig. 13. a, The head of the thigh bone of a child. b, The ligamentum rotundum connecting it to the acetabulum. c, The capsular ligament of the joint with its arteries injected. d, The numerous vessels of the mucilaginous gland injected.

Fig. 14. The Back-view of the Cartilages of the Larynx, with the Os Hyoides.

a, The posterior part of the base of the os hyoides. b b, Its cornua. c, The appendix of the right side. d, A ligament sent out from the appendix of the left side, to the styloid process of the temporal bone. e, The union of the base with the left cornu. f f, The posterior sides of (g) the thyroid cartilage. h h, Its superior



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superior cornua. i i, Its inferior cornua. k, The cricoid cartilage. l l, The arytenoid cartilages. m, The entry into the lungs, named *glottis*. n, The epiglottis. o o, The superior cartilages of the trachea. p, Its ligamentous back-part.

Fig. 15. The Superior Concave surface of the Sesamoid Bones at the first joint of the Great Toe, with their Ligaments.

a, Three sesamoid bones. b, The ligamentous substance in which they are formed.

Part II. Of the SOFT PARTS in General; Of the COMMON INTEGUMENTS, with their Appendages; And of the MUSCLES.

73 ANATOMICAL writers usually proceed to a description of the muscles after having finished the osteology; but we shall deviate a little from the common method, with a view to describe every thing clearly and distinctly, and to avoid a tautology which would otherwise be unavoidable. All the parts of the body are so intimately connected with each other, that it seems impossible to convey a just idea of any one of them, without being in some measure obliged to say something of others; and on this account we wish to mention in this place the names and situation of the principal viscera of the body, that when mention is hereafter made of any one of them in the course of the work, the reader may at least know where they are placed.

After this little digression, the common integuments, and after them the muscles will be described; we then propose to enter into an examination of the several viscera and their different functions. In describing the brain, occasion will be taken to speak of the nerves and animal spirits. The circulation of the blood will follow the anatomy of the heart, and the secretions and other matter will be introduced in their proper places.

The body is divided into three great cavities. Of these the uppermost is formed by the bones of the cranium, and incloses the brain and cerebellum.

The second is composed of the vertebræ of the back, the sternum, and true ribs, with the additional assistance of muscles, membranes, and common integuments, and is called the *thorax*—It contains the heart and lungs.

The third, and inferior cavity, is the abdomen. It is separated from the thorax by means of the diaphragm, and is formed by the lumbar vertebræ, the os sacrum, the ossa innominata, and the false ribs, to which we may add the peritonium, and a variety of muscles. This cavity incloses the stomach, intestines, omentum or cawl, liver, pancreas, spleen, kidneys, urinary bladder, and parts of generation.

Under the division of common integuments are usually included the epidermis, or scarf-skin, the reticulum mucosum of Malpighi, the cutis, or true skin, and the membrana adiposa—The hair and nails, as well as the sebaceous glands may be considered as appendages to the skin.

Sect. I. *Of the* Skin.

§ 1. *Of the* Scarf-*skin*.

74 Cuticula. The epidermis, cuticula, or scarf-skin, is a fine, transparent, and insensible pellicle, destitute of nerves and blood-vessels, which invests the body, and every where covers the true skin. This scarf-skin, which seems to be very simple, appears, when examined with a microscope, to be composed of several laminæ or scales which are increased by pressure, as we may observe in the hands and feet, where it is frequently much thickened, and becomes perfectly callous. It seems to adhere to the cutis by a number of very minute filaments, but may easily be separated from it by heat, or by maceration in water. Some anatomical writers have supposed that it is formed by a moisture exhaled from the whole surface of the body, which gradually hardens when it comes into contact with the air. They were perhaps induced to adopt this opinion, by observing the speedy regeneration of this part of the body when it has been by any means destroyed, it appearing to be renewed on all parts of the surface at the same time; whereas other parts which have been injured, are found to direct their growth from their circumference only towards their centre. But a demonstrative proof that the epidermis is not a fluid hardened by means of the external air, is that the fœtus in utero is found to have this covering. Lieuwenhoeck supposed its formation to be owing to the expansion of the extremities of the excretory vessels which are found every where upon the surface of the true skin. Ruysch attributed its origin to the nervous papillæ of the skin; and Heister thinks it probable, that it may be owing both to the papillæ and the excretory vessels. The celebrated Morgagni, on the other hand, contends*, that it is nothing more than the surface of the cutis, hardened and rendered insensible by the liquor amnii in utero, and by the pressure of the air. This is a subject, however, on which we can advance nothing with certainty.

* *Adversar. Anat.* II. *Animadver.* 2.

The cuticle is pierced with an infinite number of pores or little holes, which afford a passage to the hairs, sweat, and insensible perspiration, and likewise to warm water, mercury, and whatever else is capable of being taken in by the absorbents of the skin. The lines which we observe on the epidermis belong to the true skin. The cuticle adjusts itself to them, but does not form them.

§ 2. *Of the Rete Mucosum.*

Between the epidermis and cutis we meet with an appearance to which Malpighi, who first described it, gave the name of *rete mucosum*, supposing it to be of a membranous structure, and pierced with an infinite number of pores; but the fact is, that it seems to be nothing more than a mucous substance which may be dissolved by macerating in water, while the cuticle and cutis preserve their texture. 75 Rete mucosum.

Of the Integuments, &c.

The colour of the body is found to depend on the colour of this rete mucosum: for in negroes it is observed to be perfectly black, whilst the true skin is of the ordinary colour.

The blisters which raise the skin when burnt or scalded, have been supposed by some to be owing to a rarefaction of this mucus; but they are more probably occasioned by an increased action of the vessels of the part, together with an afflux and effusion of the thinner parts of the blood.

§ 3. *Of the* Cutis, *or True Skin.*

76 Cutis.

The cutis is composed of fibres closely compacted together, as we may observe in leather, which is the prepared skin of animals. These fibres form a thick network, which every where admits the filaments of nerves, and an infinite number of blood-vessels and lymphatics.

The cutis, when the epidermis is taken off, is found to have, throughout its whole surface, innumerable papillæ, which appear like very minute granulations, and seem to be calculated to receive the impressions of the touch, being the most easily observed where the sense of felling is the most delicate, as in the palms of the hands and on the fingers.

These papillæ are supposed by many antomical writers to be continuations of the pulpy substance of nerves, whose coats have terminated in the cellular texture of the skin. The great sensibility of these papillæ evidently proves them to be exceedingly nervous; but surely the nervous fibrillæ of the skin are of themselves scarcely equal to the formation of these papillæ, and it seems to be more probable that they are formed like the rest of the cutis.

These papillæ being described, the uses of the epidermis and the reticulum mucosum will be more easily understood; the latter serving to keep them constantly moist, while the former protects them from the external air, and modifies their too great sensibility.

§ 4. *Of the* Glands *of the Skin.*

77 The sebaceous glands.

In different parts of the body we meet, within the substance of the skin, with certain glands or follicles, which discharge a fat and oily humour that serves to lubricate and soften the skin. When the fluid they secrete has acquired a certain degree of thickness, it approaches to the colour and consistence of suet; and from this appearance they have derived their name of *sebaceous glands*. They are found in the greatest number in the nose, ear, nipple, axilla, groin, scrotum, vagina, and prepuce.

Besides these sebaceous glands, we read, in anatomical books, of others that are described as small spherical bodies placed in all parts of the skin, in much greater abundance than those just now mentioned, and named *miliary*, from their supposed resemblance to millet-seed. Steno, who first described these glands, and Malpighi, Ruysch, Verheyen, Winflow, and others, who have adopted his opinions on this subject, speak of them as having excretory ducts, that open on the surface of the cuticle, and distil the sweat and matter of insensible perspiration; and yet, notwithstanding the positive manner in which these pretended glands have been spoken of, we are now sufficiently convinced that their existence is altogether imaginary.

5. *Of the* Insensible *Perspiraton and* Sweat.

78 Insensible perspiration.

The matter of insensible perspiration, or in other words, the subtile vapour that is continually exhaling from the surface of the body, is not secreted by any particular glands, but seems to be derived wholly from the extremities of the minute arteries that are every where dispersed through the skin. These exhaling vessels are easily demonstrated in the dead subject, by throwing water into the arteries; for then small drops exude from all parts of the skin, and raise up the cuticle, the pores of which are closed by death; and in the living subject, a looking-glass placed against the skin, is soon obscured by the vapour. Bidloo fancied he had discovered ducts leading from the cutis to the cuticle, and transmitting this fluid; but in this he was mistaken.

When the perspiration is by any means increased, and several drops that were insensible when separate, are united together and condensed by the external air, they form upon the skin small, but visible, drops called *sweat* (N). This particularly happens after much exercise, or whatever occasions an increased determination of fluids to the surface of the body; a greater quantity of perspirable matter being in such cases carried through the passages that are destined to convey it off.

79 Whether these are one and the same or different excretions.

It has been disputed, indeed, whether the insensible perspiration and sweat are to be considered as one and the same excretion, differing only in degree; or whether they are two distinct excretions derived from different sources. In support of the latter opinion, it has been alleged, that the insensible perspiration is agreeable to nature, and essential to health, whereas sweat may be considered as a species of disease. But this argument proves nothing; and it seems probable, that both the insensible vapour and the sweat are exhaled in a similar manner, though they differ in quantity, and probably in their qualities; the former being more limpid, and seemingly less impregnated with salts than the latter; at any rate we may consider the skin as an emunctory through which the redundant water, and sometimes the other more saline parts of the blood, are carried off. 80 Their uses.

But the insensible perspiration is not confined to the skin only—a great part of what we are constantly throwing off in this way is from the lungs. The quantity of fluid exhaled from the human body by this insensible perspiration is very considerable. Sanctorius (O) an Italian physician, who indefatigably passed a great many

(N) Lieuwenhoek asserts that one drop of sweat is formed by the conflux of fifteen drops of perspirable vapour.

(O) The insensible perspiration is sometimes distinguished by the name of this physician, who was born in the territories of Venice, and was afterwards a professor in the university of Padua. After estimating the aliment he took in, and the sensible secretions and discharges, he was enabled to ascertain with great accuracy the weight or quantity of insensible perspiration by means of a statical chair which he contrived for this purpose; and

Of the Integuments, &c.

many years in a series of statical experiments, demonstrated long ago what has been confirmed by later observations, that the quantity of vapour exhaled from the skin and from the surface of the lungs, amounts nearly to 5-8ths of the aliment we take in. So that if in the warm climate of Italy a person eats and drinks the quantity of eight pounds in the course of a day, five pounds of it will pass off by insensible perspiration, while three pounds only will be evacuated by stool, urine, saliva, &c. But in countries where the degree of cold is greater than in Italy, the quantity of perspired matter is less; in some of the more northern climates, it being found not to equal the discharge by urine. It is likewise observed to vary according to the season of the year, and according to the constitution, age, sex, diseases, diet, exercise, passions, &c. of different people.

From what has been said on this subject, it will be easily conceived, that this evacuation cannot be either much increased or diminished in quantity without affecting the health.

The perspirable matter and the sweat are in some measure analogous to the urine, as appears from their taste and saline nature (P). And it is worthy of observation, that when either of the secretions is increased in quantity, the other is diminished; so that they who perspire the least, usually pass the greatest quantity of urine, and vice versa.

§ 6. *Of the* Nails.

81 The nails.

The nails are of a compact texture, hard and transparent like horn. Their origin is still a subject of dispute. Malpighi supposed them to be formed by a continuation of the papillæ of the skin: Ludwig, on the other hand, maintained, that they were composed of the extremities of blood-vessels and nerves; both these opinions are now deservedly rejected.

They seem to possess many properties in common with the cuticle; like it they are neither vascular nor sensible, and when the cuticle is separated from the true skin by maceration or other means, the nails come away with it.

They appear to be composed of different layers, of unequal size, applied one over the other. Each layer seems to be formed of longitudinal fibres.

In each nail we may distinguish three parts, viz. the root, the body or middle, and the extremity. The root is a soft, thin, and white substance, terminating in the form of a crescent; the epidermis adheres very strongly to this part; the body of the nail is broader, redder, and thicker, and the extremity is of still greater firmness.

The nails increase from their roots, and not from their upper extremity.

Their principal use is to cover and defend the ends of the fingers and toes from external injury.

§ 7. *Of the* Hair.

82 The hair.

The hairs, which from their being generally known do not seem to require any definition, arise from distinct capsules or bulbs seated in the cellular membrane under the skin (Q). Some of these bulbs inclose several hairs. They may be observed at the roots of the hairs which form the beard or whiskers of a cat.

The hairs, like the nails, grow only from below by a regular propulsion from their root, where they receive their nourishment. Their bulbs, when viewed with a microscope, are found to be of various shapes. In the head and scrotum they are roundish; in the eyebrows they are oval; and in other parts of the body they are nearly of a cylindrical shape. Each bulb seems to consist of two membranes, between which there is a certain quantity of moisture. Within the bulb the hair separates into three or four fibrillæ; the bodies of the hairs, which are the parts without the skin, vary in softness and colour according to the difference of climate, age, or temperament of body (R).

Their general use in the body does not seem to be absolutely determined; but hairs on particular parts, as on the eye-brows and eye-lids, are destined for particular uses, which will be mentioned when those parts are described.

§ *Of the* Cellular Membrane *and* Fat.

83 Cellular membrane.

The cellular membrane is found to invest the most minute fibres we are able to trace; so that by modern physiologists, it is very properly considered as the universal connecting medium of every part of the body.

It is composed of an infinite number of minute cells united together, and communicating with each other. The two diseases peculiar to this membrane are proofs of such a communication; for in the *emphysema* all its cells are filled with air, and in the anasarca they are universally distended with water. Besides these proofs of communication from disease, a familiar instance of it may be observed among butchers, who usually puncture this membrane, and by inflating it with air add to the good appearance of their meat.

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and from his experiments, which were conducted with great industry and patience, he was led to determine what kinds of solid or liquid aliment increased or diminished it. From these experiments he formed a system, which he published at Venice in 1614, in the form of aphorisms, under the title of "Ars de Medicina Statica."

(P) Minute chrystals have been observed to shoot upon the cloaths of men who work in glass-houses. *Haller Elem. Phys.*

(Q) Malpighi, and after him the celebrated Ruysch, supposed the hairs to be continuations of nerves, being of opinion that they originated from the papillæ of the skin, which they considered as nervous; and as a corroborating proof of what they advanced, they argued the pain we feel in plucking them out; but later anatomists seem to have rejected this doctrine, and consider the hairs as particular bodies, not arising from the papillæ for in the parts where the papillæ abound most there are no hairs), but from bulbs or capsules, which are peculiar to them.

(R) The hairs likewise differ from each other, and may not improperly be divided into two classes; one of which may include the hair of the head, chin, pubes, and axillæ; and the other, the softer hairs, which are to be observed almost every where on the surface of the body.

The cells of this membrane serve as reservoirs to the oily part of the blood or *Fat*, which seems to be deposited in them, either by transudation through the coats of the arteries, that ramify through these cells, or by particular vessels, continued from the end of arteries.

84 Fat.

These cells are not of a glandular structure, as Malpighi and others after him have supposed. The fat is absorbed and carried back into the system by the lymphatics. The great waste of it in many diseases, particularly in the consumption, is a sufficient proof that such an absorption takes place.

The fulness and size of the body are in a great measure proportioned to the quantity of fat contained in the cells of this membrane.

In the living body it seems to be a fluid oil, which concretes after death. In graminivorous animals, it is found to be of a firmer consistence than in man.

The fat is not confined to the skin alone, being met with every where in the interstices of muscles, in the omentum, about the kidneys, at the basis of the heart, in the orbits, &c.

The chief uses of the fat seems to be to afford moisture to all the parts with which it is connected; to facilitate the action of the muscles; and to add to the beauty of the body, by making it every where smooth and equal.

85. Sect. II. *Of the* Muscles.

The muscles are the organs of motion. The parts that are usually included under this name consist of distinct portions of flesh, susceptible of contraction and relaxation; the motions of which, in a natural and healthy state, are subject to the will, and for this reason they are called *voluntary* muscles. But besides these, there are other parts of the body that owe their power of contraction to their muscular fibres; thus the heart is of a muscular texture, forming what is called a *hollow* muscle; and the urinary bladder, stomach, intestines, &c. are enabled to act upon their contents, merely because they are provided with muscular fibres. These are called *involuntary* muscles, because their motions are not dependent on the will. The muscles of respiration, being in some measure influenced by the will, are said to have a *mixed* motion.

The names by which the voluntary muscles are distinguished, are founded on their size, figure, situation, use, or the arrangement of their fibres, or their origin and insertion. But besides these particular distinctions, there are certain general ones that require to be notified. Thus, if the fibres of a muscle are placed parallel to each other in a straight direction, they form what is styled a *rectilinear* muscle; if the fibres cross and intersect each other, they constitute a *compound* muscle; a *radiated* one, if the fibres are disposed in the manner of rays; or a *penniform* muscle, if, like the plume of a pen, they are placed obliquely with respect to the tendon.

Muscles that act in opposition to each other, are called *antagonistæ*; thus every extensor or muscle has a flexor for its antagonist, and *vice versa*. Muscles that concur in the same action are styled *congeneres*.

The muscles being attached to the bones, the latter may be considered as levers that are moved in different directions by the contraction of those organs.

The end of a muscle which adheres to the most fixed part is usually called the *origin*, and that which adheres to the more moveable part, the *insertion*, of the muscle.

In every muscle we may distinguish two kinds of fibres; the one soft, of a red colour, sensible, and irritable, called *fleshy* fibres; the other of a firmer texture, of a white glistening colour, insensible, without irritability or the power of contracting, and named tendinous fibres. They are occasionally intermixed; but the fleshy fibres generally prevail in the belly or middle part of a muscle, and the tendinous ones in the extremities. If these tendinous fibres are formed into a round slender chord, they form what is called the *tendon* of the muscle; on the other hand, if they are spread into a broad flat surface, the extremity of the muscle is styled *aponeurosis*.

The tendons of many muscles, especially when they are long and exposed to pressure or friction in the grooves formed for them in the bones, are surrounded by a tendinous sheath or *fascia*, in which we sometimes find a small mucous sac or *bursa mucosa*, which obviates any inconvenience from friction. Sometimes we find whole muscles, and even several muscles, covered by a fascia of the same kind, that affords origin to many of their fibres, dipping down between them, adhering to the ridges of bones, and thus preventing them from swelling too much when in action. The most remarkable instance of such a covering is the *fascia lata* of the thigh.

Each muscle is inclosed by a thin covering of cellular membrane, which has been sometimes improperly considered as peculiar to the muscles, and described under the name of *propria membrana musculosa*. This cellular covering dips down into the substance of the muscle, connecting and surrounding the most minute fibres we are able to demonstrate, and affording a support to their vessels and nerves.

Lieuwenhoeck fancied he had discovered, by means of his microscope, the ultimate division of a muscle, and that he could point out the simple fibre, which appeared to him to be an hundred times less than a hair; but he was afterwards convinced how much he was mistaken on this subject, and candidly acknowledged, that what he had taken for a simple fibre was in fact a bundle of fibres.

It is easy to observe several of these fasculi or bundles in a piece of beef, in which, from the coarseness of its texture, they are very evident.

The red colour which so particularly distinguishes the muscular or fleshy parts of animals, is owing to an infinite number of blood-vessels that are dispersed through their substance. When we macerate the fibres of a muscle in water, it becomes of a white colour like all other parts of the body divested of their blood. The blood-vessels are accompanied by nerves, and they are both distributed in such abundance to these parts, that in endeavouring to trace the course of the blood-vessels in a muscle, it would appear to be formed altogether by their ramifications; and in an attempt to follow the branches of its nerves, they would be found to be equal in proportion.

If a muscle is pricked or irritated, it immediately contracts. This is called its irritable principle; and this

Of the Muscles. this irritability is to be considered as the characteristic of muscular fibres, and may serve to prove their existence in parts that are too minute to be examined by the eye. This power, which disposes the muscles to contract when stimulated, independent of the will, is supposed to be inherent in them; and is therefore named *vis insita*. This property is not to be confounded with elasticity, which the membranes and other parts of the body possess in a greater or less degree in common with the muscles; nor with sensibility, for the heart, though the most irritable, seems to be the least sensible of any of the muscular parts of the body.

86 Of the vis insita.

After a muscular fibre has contracted, it soon returns to a state of relaxation, till it is excited afresh, and then it contracts and relaxes again. We may likewise produce such a contraction, by irritating the nerve leading to a muscle, although the nerve itself is not affected.

This principle is found to be greater in small than in large, and in young than in old, animals.

In the voluntary muscles these effects of contraction and relaxation of the fleshy fibres are produced in obedience to the will, by what may be called the *vis nervosa*, a property that is not to be confounded with the *vis insita*. As the existence of a *vis insita* different from a *vis nervea*, was the doctrine taught by Doctor Haller in his *Elem. Phys.* but is at present called in question by several, particularly Dr Monro, we think it necessary to give a few objections, as stated in his Observations on the Nervous System:

87 The vis nervea.

"The chief experiment (says the Doctor), which seems to have led Dr Haller to this opinion, is the well-known one, that the heart and other muscles, after being detached from the brain, continue to act spontaneously, or by stimuli may be roused into action for a considerable length of time; and when it cannot be alledged, says Dr Haller, that the nervous fluid is by the mind, or otherwise, impelled into the muscle.

"That in this instance, we cannot comprehend by what power the nervous fluid or energy can be put in motion, must perhaps be granted: But has Dr Haller given a better explanation of the manner in which his supposed vis insita becomes active?

"If it be as difficult to point out the cause of the action of the vis insita as that of the action of the vis nervea, the admission of that new power, instead of relieving, would add to our perplexity.

"We should then have admitted, that two causes of a different nature were capable of producing exactly the same effect; which is not in general agreeable to the laws of nature.

"We should find other consequences arise from such an hypothesis, which tend to weaken the credibility of it. For instance, if in a sound animal the vis nervea alone produces the contraction of the muscles, we will ask what purpose the vis insita serves? If both operate, are we to suppose that the vis nervea, impelled by the mind or living principle, gives the order, which the vis insita executes, and that the nerves are the internuntii; and so admit two wise agents employed in every the most simple action? But instead of speculating farther, let us learn the effect of experiments, and endeavour from these to draw plain conclusions.

"1. When I poured a solution of opium in water under the skin of the leg of a frog, the muscles, to the surface of which it was applied, were very soon deprived of the power of contraction. In like manner, when I poured this solution into the cavity of the heart, by opening the vena cava, the heart was almost instantly deprived of its power of motion, whether the experiment was performed on it fixed in its place, or cut out of the body.

"2. I opened the thorax of a living frog; and then tied or cut its aorta, so as to put a stop to the circulation of its blood.

"I then opened the vena cava, and poured the solution of opium into the heart; and found, not only that this organ was instantly deprived of its powers of action, but that in a few minutes the most distant muscles of the limbs were extremely weakened. Yet this weakness was not owing to the want of circulation, for the frog could jump about for more than an hour after the heart was cut out.

"In the first of these two experiments, we observed the supposed vis insita destroyed by the opium; in the latter, the vis nervea; for it is evident that the limbs were affected by the sympathy of the brain, and of the nervous system in general, with the nerves of the heart.

"3. When the nerve of any muscle is first divided by a transverse section, and then burnt with a hot iron, or punctured with a needle, the muscle in which it terminates contracts violently, exactly in the same manner as when the irritation is applied to the fibres of the muscle. But when the hot iron, or needle, is confined to the nerve, Dr Haller himself must have admitted, that the vis nervea, and not the vis insita, was excited. But here I would ask two questions.

"First, Whether we do not as well understand how this vis nervea is excited when irration is applied to the muscle as when it is applied to the trunk of the nerve, the impelling power of the mind seeming to be equally wanting in both cases?

"Secondly, If it appears that irritation applied to the trunk of a nerve excites the vis nervea, why should we doubt that it can equally well excite it when applied to the small and very sensible branches and terminations of the nerve in the muscle?

"As, therefore, it appears that the supposed vis insita is destroyed or excited by the same means as the vis nervea; nay, that when, by the application of opium to the heart of a frog, after the aorta is cut and the circulation interrupted, we have destroyed the vis insita, the vis nervea is so much extinguished, that the animal cannot act with the distant muscles of the limb; and that these afterwards grow very torpid, or lose much of their supposed vis insita; it seems clearly to follow, that there is no just ground for supposing that any other principle produces the contraction of a muscle."

The *vis nervosa*, or operation of the mind, if we may so call it, by which a muscle is brought into contraction, is not inherent in the muscle like the *vis insita*; neither is it perpetual, like this latter property. After long continued or violent exercise, for example, the

Of the Integuments, &c.

the voluntary muscles become painful, and at length incapable of further action; whereas the heart and other involuntary muscles, the motions of which depend solely on the *vis insita*, continue through life in a constant state of action, without any inconvenience or waste of this inherent principle.

The action of the vis nervosa on the voluntary muscles, constitutes what is called *muscular motion*; a subject that has given rise to a variety of hypothesis, many of them ingenious, but none of them satisfactory.

Borelli and some others have undertaken to explain the cause of contraction, by supposing that every muscular fibre forms as it were a chain of very minute bladders, while the nerves which are distributed through the muscles, bring with them a supply of animal spirits, which at our will fill these bladders, and by increasing their diameter in width, shorten them, and of course the whole fibre.

Borelli supposes these bladders to be of a rhomboidal shape; Bernouilli on the other hand contends that they are oval. Our countryman, Cowper, fancied he had filled them with mercury; the cause of this mistake was probably owing to the mercury's insinuating itself into some of the lymphatic vessels. The late ingenious Mr Elliot undertook to account for the phenomena of muscular motion on principles very different from those just now mentioned. He supposed that a dephlogisticated state of the blood is requisite for muscular action, and that a communication of phlogiston to the blood is a necessary effect of such action.

We know that the muscular fibre is shortened, and that the muscle itself swells when in action; but how these phenomena are produced, we are unable to determine. We likewise know that the nerves are essential to muscular motion; for upon dividing or making a ligature round the nerve leading to a muscle, the latter becomes incapable of motion. A ligature made on the artery of a muscle produces a similar effect; a proof this, that a regular supply of blood is also equally necessary to muscular motion. The cause of palsy is usually not to be sought for in the muscle affected, but in the nerve leading to that muscle, or in that part of the brain or spinal marrow from which the nerve derives its origin.

Of the particular Muscles.

As the enumeration and discription of the particlar muscles must be dry and unentertaining to the generality of readers, yet can not be altogether omited in a work of this nature, it appeared eligible to throw this part of the subject into the form of a table; in which the name, origin, insertion, and principal use of each muscle, will be found described in few words, and occasionally its etymology when it is of Greek derivation or difficult to be understood.

A TABLE of the MUSCLES arranged according to their SITUATION.

[N. B. This table does not include all the muscles of the body; those belonging to the eyes, internal ear, intestinum rectum, and the male and female organs of generation, being described in other parts of the work. The reader will be pleased to observe likewise, that although all the muscles (a few only excepted) are in pairs, mention is here made only of the muscles of one side.]

MUSCLES situated	*Name.*	*Origin.*	*Insertion*	*Use.*
under the integuments of the cranium	1. Occipito frontalis.	From the transverse ridge of the os occipitis.	Into the skin of the eye-brows.	To pull the skin of the head backwards, and to raise the eye-brows and skin of the forehead.
	2. Corrugator supercilii.	From above the joining of the os frontis, os nasi, and os maxillare.	Into the inner part of the occipito-frontalis.	To draw the eye-brows towards each othes, and to wrinkle the forehead.
——of the eye-lids	1. Orbicularis palpebrarum.	From around the edge of the orbit.	Into the nasal proces of the os maxillare.	To shut the eye.
	2. Levator palpebræ superioris.	From the bottom of the orbit, near the optic foramen.	Into the cartilage of the upper eye-lid.	To open the eye.
——of the external ear	1. Attolens auriculam.	From the tendon of the occipito frontalis near the os temporis.	Into the upper part of the ear.	To raise the ear.
	2. Anterior auriculæ.	From near the back part of the zygoma.	Into an eminence behind the helix.	To raise this eminence, and to pull it forwards.

3. Re-

Of the Muscles. | Of the Muscles.

Group	Name.	Origin.	Insertion.	Use.
	3. Retrahentes (s) auriculæ.	From the outer and back part of the root of the mastoid process.	Into the convex part of the concha.	To stretch the concha, and pull the ear backwards.
Muscles of the cartilages of the ear	1. Tragicus.	From the outer and middle part of the concha, near the tragus.	Into the upper part of the tragus.	To depress the concha, and pull the point of the tragus a little outwards.
	2. Anti-tragicus.	From the root of the inner part of the helix.	Into the upper part of the anti-tragus.	To dilate the mouth of the concha.
	3. Transversus-auriculæ.	From the upper part of the concha.	Into the inner part of the helix.	To stretch the concha and scapha, and likewise to pull the parts it is connected with towards each other.
	4. Helicis major.	From the upper, anterior, and acute part of the helix.	Into the cartilage of the helix, a little above the tragus.	To depress the upper part of the helix.
	5. Helicis minor.	From the lower and fore part of the helix.	Into the helix, near the fissure in its cartilage.	To contract the fissure.
——— of the nose,	1. Compressor (t) naris.	From the outer part of the root of the ala nasi.	Into the nasal process of the os maxillare, and anterior extremity of the os nasi.	To straighten the nostrils, and likewise to corrugate the skin of the nose.
——— of the mouth and lips,	1. Levator labii superioris, alæque nasi.	From the outer part of the orbitar process of the os maxillare, and from the nasal process of that bone, where it joins the os frontis.	Into the upper lip and ala of the nose.	To draw the upper lip and skin of the nose upwards and outwards.
	2. Levator anguli oris.	From the os maxillare superius, between the orbitar foramen and the first dens molares.	Into the orbicularis oris at the angle of the mouth.	To raise the corner of the mouth.
	3. Zygomaticus major.	From the os malæ near the zygomatic suture.	Into the angle of the mouth.	To raise the angle of the mouth, and make the cheek prominent, as in laughing.
	4. Zygomaticus minor.	Immediately above the origin of the zyg. major.	Into the angle of the mouth.	To raise the angle of the mouth obliquely outwards.
	5. Buccinator.	From the alveoli of the dentes molares in the upper and lower jaws.	Into the angle of the mouth.	To contract the mouth and draw the angle of it outwards and backwards.
	6. Depressor labii superioris, alæque nasi.	From the os maxill. super. immediately above the gums of the dentes incisores.	Into the root of the ala nasi and upper lip.	To draw the ala nasi and upper lip downwards.

(s) These are three small slender muscles. The inferior one is sometimes wanting.

(t) The nose is affected by fibres of the occipito frontalis, and by several muscles of the face; but this pair, the compressores, is the only one that is proper to it.

	Name.	Origin.	Insertion.	Use.
	7. Depressor auguli oris.	At the side of the chin from the lower edge of the maxilla inferior.	Into the angle of the mouth.	To draw the corner of the mouth downwards.
	8. Depressor labii inferioris.	From the lower and anterior part of the maxilla inferior.	Into the under lip.	To draw the under lip downwards and somewhat outwards
	9. Levator labii inferioris.	From near the gums of the incisores and caninus of the maxilla inferior.	Into the under lip and skin of the chin.	To raise the under lip and skin of the chin.
	10. Orbicularis Oris (u).			To shut the mouth by constringing the lips.
Muscles of the lower jaw, - -	1. Temporalis.	From part of the os bregmatis and os frontis; squamous part of the os temporis; back part of the os malæ, and the temporal process of the os sphenoides (v)	Into the coronoid process of the lower jaw.	To move the lower jaw upwards.
	2. Masseter (w).	From the malar process of the os maxillare, and the lower edges of the os malæ, and of the zygomatic process of the os temporis.	Into the basis of the coronoid process, and that part of the jaw which supports that and the condyloid process.	To raise and likewise to move the jaw a little forwards and backwards.
	3. Pterygoideus internus.	From the inner surface of the outer wing of the pterygoid process of the os sphenoides, and from the process of the os palati that helps to form the pterygoid fossa	Into the lower jaw on its inner side and near its angle.	To raise the lower jaw and draw it a little to one side.
	4. Pterygoideus externus.	From the external ala of the pterygoid process, a small part of the adjacent os maxillare, and a ridge in the temporal process of the os sphenoides.	Into the fore part of the condyloid process of the lower jaw, and likewise of the capsular ligament.	To move the jaw forwards and to the opposite side (x); and at the same time to prevent the ligament of the joint from being pinched.
——— situated at the fore part of the neck.	1. Latissimus colli (y).	From the cellular membrane covering	Into the side of the chin and integu-	To draw the cheeks and skin of the face

(u) This muscle is, in a great measure, if not wholly, formed by the buccinator, zygomatici, depressores, and other muscles that move the lips. Its fibres surround the mouth like a ring.

(v) Some of its fibres likewise have their origin from a strong fascia that covers the muscle and adheres to the bone round the whole circumference of its origin. When we remove this covering, we find the muscle of a semicircular shape with its radiated fibres, converging and forming a strong middle tendon.

(w) So called from its use in chewing, its derivation being from μασιαομαι, *manduco*, "to eat."

(x) This happens when the muscle acts singly. When both act, the jaw is brought horizontally forwards.

(y) This broad and thin muscular expansion, which is situated immediately under the common integuments, is by Winslow named *musculus cutaneus*. Galen gave it the name of πλατυσμα μυωδης (*Platysma-myoides*); the etymology of which is from πλατυσμος, *dilatatio*, and μυς, *musculus*, and ειδος, *forma*.

	Name.	Origin.	Insertion.	Use.
		the pectoral, deltoid, and trapezius muscles.	ments of the cheek.	downwards: and when the mouth is shut, to draw all that part of the skin to which it is connected below the lower jaw upwards.
	2. Mastoideus (z).	From the upper part of the sternum, and from the upper and fore part of the clavicle.	Into the mastoid process, and as far back as the lambdoidal suture.	To move the head to one side, or when both muscles act, to bend it forwards.
Muscles situated between the trunk and the os hyoides.	1. Omo-hyoideus (A)	From the upper costa of the scapula near its niche; from part of a ligament that extends across this niche, and sometimes by a few fibres, from the coracoid process.	Into the basis of the os hyoides.	To draw the os hyoides in an oblique direction downwards.
	2. Sterno-hyoideus.	From the cartilage of the first rib, the inner and upper part of the sternum, and a small part of the clavicle.	Into the basis of the os hyoides.	To draw the os hyoides downwards.
	3. Hyo-thyroideus.	From part of the basis and horn of the os hyoides.	Into a rough oblique line at the side of the thyroid cartilage.	To raise the thyroid cartilage, or depress the os hyoides.
	4. Sterno-thyroideus	From between the cartilages of the 1st and 2d ribs at the upper and inner part of the sternum.	Immediately under the hyo-thyroideus.	To pull the thyroid cartilage downwards.
	5. Crico-thyroideus.	From the anterior part and side of the cricoid cartilage.	Into the lower part and inferior horn of the thyroid cartilage.	To pull the cricoid cartilage upwards and backwards, or the thyroid forwards and downwards.
——— situated between the os hyoides and lower jaw,	1. Diagrasticus (B)	From a fossa at the root of the mastoid process, and likewise from the os hyoides.	Into the lower and anterior part of the chin.	To draw the lower jaw downwards.
	2. Stylo-hyoideus (c)	From the basis of the styloid process.	Into the side and fore part of the os hyoides near its base.	To draw the os hyoides obliquely upwards.

 3. Mylo-

(z) This, on account of its two origins, is by Albinus described as two distinct muscles, which he names *sterno-mastoideus* and *cleido-mastoideus*.

(A) This muscle does not always arise from the coracoid process, it seems to have been improperly named *caraco-hyoides* by Douglas and Albinus. Winslow calls it *omo-hyoideus*, on account of its general origin from the scapula.

(B) From δις and γαστηρ (*biventer*), because it has two fleshy bellies with a middle tendon. This tendon passes through the stylo-hyoideus.

(c) In some subjects we meet with another muscle, which from its having nearly the same origin, insertion, and use as this, has been named *stylo-hyoideus alter*.

	Name.	Origin.	Insertion.	Use.
	3. Mylo-hyoideus (D)	From the inside of the lower jaw, between the last dens molaris and the chin.	Into the basis of the os hyoides.	To move the os hyoides to either side, forwards or upwards.
	4. (E) Genio-hyoideus.	From the inside of the chin.	Into the base of the os hyoides.	To move the os hyoides forwards or upwards.
	5. Genio-glossus.	From the inside of the chin.	Into the tongue and basis of the os hyoides.	To move the tongue in various directions.
	6. Hyo-glossus (F)	From the horn, basis, and appendix of the os hyoides.	Into the tongue laterally.	To draw the tongue downwards and inwards.
	7. Lingualis.	Laterally from the root of the tongue.	Into the extremity of the tongue.	To shorten the tongue and draw it backwards.
	8. Stylo-glossus.	From the styloid process, and sometimes also from a ligament that extends from thence to the angle of the lower jaw.	Into the side of the tongue from the root to near its tip.	To move the tongue backwards and to one side.
	9. Stylo-pharyngæus.	From the basis of the styloid process.	Into the side of the pharynx and posterior part of the thyroid cartilage.	To raise the thyroid cartilage and pharynx, and likewise to dilate the latter.
	10. Circumflexus-palati.	From near the bony part of the Eustachian tube, and from the spinous process of the os sphenoides.	Into the semilunar edge of the os palati and the velum pendulum palati (G).	To dilate and draw the velum obliquely downwards.
	11. Levator palati.	From the membranous part of the Eustachian tube, and the extremity of the os petrosum.	Into the velum pendulum palati.	To pull the velum backwards.
Muscles situated about the fauces,	1 Palato-pharyngæus.	From the lower and anterior part of the cartilaginous extremity of the Eustachian tube (H); the tendinous expansion of the circumflexus palati; and the velum pendulum palati near the basis and black part of the uvula.	Into the upper and posterior part of the thyroid cartilage.	To raise the pharynx and thyroid cartilage, or to pull the velum and uvula backwards and downwards.

2. Constrictor

(D) So named from its arising near the dentes molares (μυλοι), and its being inserted into the os hyoides.
(E) From γενειον, *mentum*, the "chin."
(F) From κηρας, *cornu*, and γλωσσα, *lingua*, "the tongue."
(G) This muscle in its course forms a round tendon, which, after passing over a kind of hook formed by the inner plate of the pterygoid process of the sphenoid bone, expands into a tendinous membrane.
(H) The few fibres that arise from the Eustachian tube are described as a distinct muscle by Albinus, under the name of *Salpingo pharyngeus*. They serve to dilate the mouth of the tube.

	Name.	Origin.	Inſertion.	Uſe.
	2. Conſtrictor iſthmi faucium.	From near the baſis of the tongue laterally.	Into the velum pendulum palati, near the baſis and fore part of the uvula.	To raiſe the tongue and draw the velum towards it (I).
	3. Azygos uvulæ.	From the end of the ſuture that unites the oſſa palati.	Into the extremity of the uvula.	To ſhorten the uvula, and bring it forwards and upwards.
MUSCLES at the back part of the pharynx	1. Conſtrictor pharyngis ſuperior.	From the cuneiform proceſs of the occipital bone; the pterygoid proceſs of the os ſphenoides, and from each jaw near the laſt dens molares (K).	Into the middle of the pharynx.	To move the pharynx upwards and forwards, and to compreſs its upper part.
	2. Conſtrictor pharyngis medius (L).	From the horn and appendix of the os hyoides, and from the ligament that unites it with the thyroid cartilage.	Into the middle of the proceſſus cuneiformis of the occipital bone, about its middle and before the great foramen.	To draw the os hyoides and pharynx upwards, and to compreſs the latter.
	3. Conſtrictor pharyngis inferior (M).	From the cricoid and thyroid cartilages.	Into the middle of the pharynx.	To compreſs part of the pharynx.
——— about the glottis - - -	1. Crico-arytænoideus lateralis.	From the ſide of the cricoid cartilage.	Into the baſis of the arytænoid cartilage laterally.	To open the glottis.
	2. Crico-arytænoideus poſticus.	From the cricoid cartilage poſteriorly.	Into the baſis of the arytænoid cartilage poſteriorly.	To open the glottis.
	3. Arytænoideus obliquis.	From the baſis of one of the arytænoid cartilages.	Near the extremity of the other arytænoid cartilage.	To draw the parts it is connected with towards each other.
	4. Arytænoideus tranſverſus.	From one of the arytænoid cartilages laterally.	Into the other arytænoid cartilage laterally.	To ſhut the glottis.
	5. Thyreo-arytænoideus.	From the poſterior and under part of the thyroid cartilage.	Into the arytænoid cartilage.	To draw the arytænoid cartilage forwards.
	6. Arytæno-epiglottideus.	From the upper part of the arytænoid cartilage laterally.	Into the ſide of the epiglottis.	To move the epiglottis outwards.
	7. Thyreo-epiglottideus.	From the thyroid cartilage.	Into the ſide of the epiglottis.	To pull the epiglottis obliquely downwards (N).

Muſcles

(I) This muſcle, and the palato-pharyngæus, likewiſe ſerve to cloſe the paſſage into the fauces, and to carry the food into the pharynx.

(K) The three orders of fibres here mentioned, with a few others derived from the tongue, have given occaſion to Douglas to deſcribe them as four diſtinct muſcles, under the names of *cephalo-pharyngæus*, *mylo-pharyngæus*, *ptery-pharyngæus*, and *gloſſo-pharyngæus*.

(L) Douglas makes two muſcles of this, the *hyo-pharyngæus* and *ſyndeſmo-pharyngæus*.

(M) The crico-pharyngæus and thyro-pharingæus of Douglas.

(N) When either this or the preceding muſcle acts with its fellow, the epiglottis is drawn directly downwarde upon the glottis.

	Name.	*Origin.*	*Insertion.*	*Use.*
Muscles at the fore part of the neck, close to the vertebræ - - - -	1. Rectus capitis internus major.	From the anterior extremities of the transverse processes of the five lowermost cervical vertebræ.	Into the fore part of the cuneiform process of the os occipitis.	To bend the head forwards.
	2. Rectus capitis internus minor.	From the anterior and upper part of the first cervical vertebræ.	Near the basis of the condyloid process of the os occipitis.	To assist the last described muscle.
	3. Rectus capitis lateralis.	From the anterior and upper part of the transverse process of the first cervical vertebra.	Into the os occipitis, opposite to the stylo-mastoid foramen.	To move the head to one side.
	4. Longus colli.	Within the thorax, laterally from the bodies of the three uppermost dorsal vertebræ; from the basis and fore part of the transverse processes of the first and second dorsal vertebræ, and of the last cervical vertebra; and, lastly, from the anterior extremities of the transverse processes of the 6th, 5th, 4th, and 3d cervical vertebræ.	Into the second cervical vertebra anteriorly.	To pull the neck to one side (o).
——— at the fore part of the abdomen - - - - -	1. Obliquus externus.	From the lower edges of the eight inferior ribs, near their cartilages.	Into the linea alba (p), ossa pubis (q), and spine of the ilium (r).	To compress and support the viscera, assist in evacuating the fæces and urine, draw down the ribs, and bend the trunk forwards, or obliquely to one side.
	2. Obliquus internus.	From the spinous process of the three lowermost lumbar	Into the cartilages of all the false ribs, linea alba (s), and	To assist the obliquus externus.

(o) When both muscles act, the neck is drawn directly forwards.

(p) The linea alba is that tendinous expansion which reaches from the cartilago ensiformis to the os pubis. It is formed by the interlacement of the tendinous fibres of the oblique and transverse muscles, and on this account some anatomists have considered these as three digastric muscles.

(q) A little above the pubis the tendinous fibres of this muscle separate from each other, so as to form an opening called the *ring* of the obliquus externus, and commonly, though improperly, the ring of the abdominal muscles, there being no such aperture either in the transversalis or obliquus externus. This ring in the male subject affords a passage to the spermatic vessels, and in the female to the round ligament of the uterus.

(r) From the anterior and upper spinous process of the ilium, this muscle is stretched tendinous to the os pubis, and thus forms what is called by some *Fallopius's*, and by others *Poupart's ligament.* The blood-vessels pass under it to the thigh.

(s) The tendon formed by the upper part of this muscle in its way to the linea alba is divided into two layers. The posterior layer runs under, and the anterior one over, the rectus muscle.

	Name.	Origin.	Inſertion.	Uſe.
		vertebræ, the back part of the os ſacrum, the ſpine of the ilium, and back part of Fallopius's ligament (T).	fore part of the pubis.	
	3. Tranſverſalis.	From the cartilages of the ſeven inferior ribs; the tranſverſe proceſſes of the laſt dorſal, and four upper lumbar vertebræ; the inner part of Fallopius's ligament and the ſpine of the ilium.	Into the linea alba and cartilago enſiformis.	To compreſs the abdominal viſcera.
	4. Rectus abdominis.	From the upper edge of the pubis and the ſymphyſis pubis.	Into the cartilages of the 5th, 6th, and 7th ribs, and the edge of the cartilago enſiformis (U).	To compreſs the fore part of the abdomen, and to bend the trunk forwards.
	5. Pyramidalis (V).	From the anterior and upper part of the pubis.	Into the linea alba and inner edge of the rectus, commonly about two inches above the pubis.	To aſſiſt the lower portion of the rectus.
Muscles at the fore part of the thorax.	1. Pectoralis Major.	From the cartilaginous ends of the 5th and 6th ribs; the ſternum, and anterior part of the clavicle.	Into the upper and inner part of the os humeri (W).	To draw the arm forwards or obliquely forwards.
	2. Subclavius.	From the cartilage of the firſt rib.	Into the under ſurface of the clavicle.	To move the clavicle forwards and downwards and to aſſiſt in raiſing the firſt rib.
	3. Pectoralis minor (X).	From the upper edges of the 3d 4th and 5th ribs.	Into the coracoid proceſs of the ſcapula.	To move the ſcapula forwards and downwards or to elevate the ribs.
	4. Serratus Magnus.	From the eight ſuperior ribs.	Into the baſis of the ſcapula.	To bring the ſcapula forwards.

Muscles

(T) From this part it detaches ſome fibres which extend downwards upon the ſpermatic chord, and from what is deſcribed as the cremaſter muſcle.

(U) The fibres of the rectus are generally divided by three tendinous interſections. The two upper thirds of this muſcle paſſing between the tendinous layers of the obliquus internus, are incloſed as it were in a ſheath; but at its lower part we find it immediately contiguous to the peritonæum, the inferior portion of tendon of the tranſverſalis paſſing over the rectus, and adhering to the anterior layer of the obliquus internus.

(V) This muſcle is ſometimes wanting.

(W) The fibres of this muſcle paſs towards the axilla in a folding manner, and with thoſe of the latiſſimus dorſi from the armpit.

(X) This and ſome other muſcles derive their name of *ſerratus*, from their ariſing from a number of tendinous or fleſhy digitations, reſembling the teeth of a ſaw (*ſerra*).

Muscles that concur in forming the thorax,	Name.	Origin.	Insertion.	Use.
	1. Diaphragma (Y).			
	2. Levatores costarum.	From the transverse processes of the last cervical and the eleven upper dorsal vertebræ.	Into the upper side of each rib, near its tuberosity.	To move the ribs upwards and outwards.
	3. Intercostales externi.	From the lower edge of each upper rib.	Into the superior edge of each lower rib.	To elevate the ribs.
	4. Intercostales interni (A).			
	5. Sterno-costales (B).	From the cartilago ensiformis, and lower and middle part of the sternum.	Into the cartilages of the 2d, 3d, 4th, 5th, and 6th ribs.	To depress the cartilages of the ribs.
——at the back part of the neck and trunk. - -	1. Trapezius (C), or cucullaris.	From the middle of the os occipitis, and the spinous processes of the two inferior cervical, and of all the dorsal, vertebræ (D).	Into the posterior half of the clavicle, part of the acromion, and the spine of the scapula.	To move the scapula.
	2. Rhomboideus (E).	From the spinous processes of the three lowermost cervical, and of all the dorsal vertebræ.	Into the basis of the scapula.	To move the scapula upwards and backwards.
	3. Latissimus dorsi.	From part of the spine of the os ilium, the spinous processes of the os sacrum and lumbar vertebræ, and of six or eight of the dorsal	Into the os humeri, at the inner edge of the groove for lodging the long head of the biceps muscle.	To draw the os humeri downwards and backwards, and to roll it upon its axis.

I

(Y) For a description of the diaphragm, see Part IV. Sect. IV.

(A) The origin, insertion, and use of the internal intercostals, are similar to those of the external. The reader, however, will be pleased to observe, that the intercostales externi occupy the spaces between the ribs only from their spine to their cartilages; from thence to the sternum, there being only a thin membrane, which is spread over the intercostales interni; and that the latter, on the contrary, extend only from the sternum to the angles of each rib.

The fibres of the external muscles run obliquely forwards; those of the internal obliquely backwards. This difference in the direction of their fibres induced Galen to suppose that they were intended for different uses; that the external intercostals, for instance, serve to elevate, and the internal ones to depress the ribs. Fallopius seems to have been the first who ventured to dispute the truth of this doctrines, which has since been revived by Boyle, and more lately still by Hamberger, whose theoretical arguments on this subject have been clearly refuted by the experiments of Haller.

(B) These consist of four, and sometimes five distinct muscles on each side. Vesalius, and after him Douglas and Albinus, consider them as forming a single muscle, which, on account of its shape, they name *triangularis*. Verheyen, Winslow, and Haller, more properly describe them as so many separate muscles, which, on account of their origin and insertion they name *sterno-costales*.

(C) So named by Riolanus, from τραπεζα, on account of its quadrilateral shape. Columbus and others gave it the name of *cucullares*, from its resemblance to a monk's hood.

(D) The tendinous fibres of this muscle, united with those of its fellow in the nape of the neck, from what is called the *ligamentum colli*.

(E) This muscle consists of two distinct portions, which are described as separate muscles by Albinus, under the names of *rhomboideus minor* and *rhomboideus major*.

Name.	Origin.	Insertion.	Use.
	sal vertebræ; also from the four inferior false ribs near their cartilages.		
4. Serratus inferior posticus.	From the spinous processes of the two lowermost dorsal, and of three of the lumbar vertebræ.	Into the lower edges of the three or four lowermost ribs near their cartilages.	To draw the ribs outwards, downwards, and backwards.
5. Levator scapulæ.	From the transverse processes of the four uppermost vertebræ colli.	Into the upper angle of the scapula.	To move the scapula forwards, and upwards.
6. Serratus superior posticus.	From the lower part of the ligamentum colli, the spinous process of the lowermost cervical vertebra, and of the two superior dorsal vertebræ.	Into the 2d, 3d, and 4th ribs.	To expand the thorax.
7. Splenius (F).	From the spinous processes of the four or five uppermost vertebræ of the back, and of the lowermost cervical vertebra.	Into the transverse processes of the two first cervical vertebræ, the upper and back part of the mastoid process, and a ridge on the os occipitis.	To move the head backwards.
8. Complexus (G).	From the transverse processes of the four or five uppermost dorsal, and of the six lowermost cervical vertebræ.	Into the os occipitis.	To draw the head backwards.
9. Trachelo-mastoideus (H).	From the transverse processes of the first dorsal vertebra, and four or five of the lowermost, cervical vertebræ.	Into the mastoid process.	To draw the head backwards.
10. Rectus capitis posticus major.	From the spinous process of the second cervical vertebra.	Into the os occipitis.	To extend the head and draw it backwards.
11. Rectus capitis posticus minor.	From the first vertebra of the neck.	Into the os occipitis.	To assist the rectus major.
12. Obliquus superior capitis.	From the transverse process of the first cervical vertebra.	Into the os occipitis.	To draw the head backwards.
13. Obliquus inferior capitis.	From the spinous process of the second cervical vertebra.	Into the transverse process of the first cervical vertebra.	To draw the face towards the shoulder, and to move the first vertebra upon the second.

(F) According to some writers, this muscle has gotten its name from its resemblance to the spleen; others derive it from *splenium splint*.
(G) So named on account of its complicated structure.
(H) So named from its origin from the neck (τραχηλος) and its insertion into the mastoid process.

Name.	Origin.	Insertion.	Use.
14. Sacro-lumbalis (I)	From the back part of the os sacrum, spine of the ilium, spinous processes and roots of the transverse processes of the vertebræ of the loins.	Into the lower edge of each rib.	To draw the ribs downwards, move the body upon its axis, assist in erecting the trunk, and turn the neck backwards, or to one side.
15. Longissimus dorsi (K).	The same as that of the sacro-lumbalis.	Into the transverse processes of the dorsal vertebræ.	To stretch the vertebræ of the back, and keep the trunk erect.
16. Spinalis dorsi.	From the spinous processes of the uppermost lumbar and lowermost dorsal vertebræ.	Into the spinous processes of the nine superior dorsal vertebræ	To extend the vertebræ.
17. Semi-spinalis dorsi.	From the transverse processes of the 7th, 8th, 9th, and 10th vertebræ of the back.	Into the spinous processes of the four uppermost dorsal, and lowermost of the cervical vertebræ.	To extend the spine obliquely backwards.
18. Multifidus Spinæ (L).	From the os sacrum, ilium, oblique and transverse processes of the lumbar vertebræ, transverse processes of the dorsal, and four of the cervical vertebræ.	Into the spinous processes of the lumbar, dorsal, and six of the cervical vertebræ.	To extend the back and draw it backwards, or to one side.
19. Semi-spinalis colli.	From the transverse processes of the five or six uppermost dorsal vertebræ.	Into the spinous processes of the 2d, 3d, 4th, 5th, and 6th cervical vertebræ.	To stretch the neck obliquely backwards.
20. Scalenus (M).	From the transverse processes of the five inferior cervical vertebræ.	Into the upper and outer part of the first and second ribs.	To move the neck forwards, or to one side.

21. Inter-

(I) Several thin fasculi of fleshy fibres arise from the lower ribs, and terminate in the inner side of this muscle. Steno names them *musculi ad sacro lumbalem accessorii.* The sacro-lumbalis likewise sends off a fleshy slip from its upper part, which by Douglas and Albinus is described as a distinct muscle, under the name *cervicalis descendens*. Morgagni has very properly considered it as a part of the sacro-lumbalis.

(K) At the upper part of this muscle a broad thin layer of fleshy fibres is found crossing, and intimately adhering to it This portion, which is described by Albinus, under the name of *transversalis cervicis*, may very properly be considered as an appendage to the longissimus dorsi. It arises from the transverse processes of the five or six superior dorsal vertebræ, and is inserted into the transverse processes of the six inferior cervical vertebræ. By means of this apppendage the longissimus dorsi may serve to move the neck to one side, or obliquely backwards.

(L) Anatomists in general have unnecessarily multiplied the muscles of the spine. Albinus has the merit of having introduced greater simplicity into this part of myology. Under the name of *multifidus spinæ*, he has very properly included those portions of muscular flesh intermixed with tendinous fibres, situated close to the back part of the spine, and which are described by Douglas under the name of *transversales colli, dorsi, & lumborum.*

(M) The ancients gave it this name from its resemblance to an irregular triangle (σκαληνος). It consists of three fleshy portions. The anterior one affords a passage to the axillary artery, and between this and the middle portion we find the nerves going to the upper extremities. The middle is in part covered by the posterior portion, which is the longest and thinnest of the three

	Name.	Origin.	Insertion.	Use.
	11. Inter-spinalis (N).	From the upper part of each of the spinous processes of the six inferior cervical vertebræ.	Into the under part of each of the spinous processes of the vertebræ above.	To draw the spinous processes towards each other.
	12. Inter-transversales (O).	From the upper part of each of the transverse processes of the vertebræ.	Into the under part of each of the transverse processes of the vertebræ above.	To draw the transverse processes towards each other.
MUSCLES within the cavity of the abdomen, on the anterior and lateral parts of the spine,	1. Psoas parvus (P).	From the sides and transverse processes of the uppermost lumbar vertebra, and sometimes of the lowermost dorsal vertebra.	Into the brim of the pelvis, at the junction of the os pubis with the ilium.	To bend the loins forwards.
	2. Psoas magnus.	From the bodies and transverse processes of the last dorsal, and all the lumbar vertebræ.	Into the os femoris, a little below the trochanter minor.	To bend the thigh forwards.
	3. Iliacus internus.	From the inner lip, hollow part, and edge of the os ilium.	In common with the psoas magnus.	To assist the psoas magnus.
	4. Quadratus lumborum (Q).	From the posterior part of the spine of the ilium.	Into the transverse processes of the four uppermost lumbar vertebræ, the inferior edge of the last rib, and the side of the lowermost dorsal vertebra.	To support the spine, or to draw it to one side.
	5. Coccygæus.	From the posterior and inner edge of the spine of the ischium.	Into the lower part of the os sacrum, and almost the whole length of the os coccygis laterally.	To draw the os coccygis forwards and inwards (R)
——— on the scapula and upper part of the os humeri,	1. Deltoides (S).	From the clavicle, processus acromion, and spine of the scapula.	Into the anterior and middle part of the os humeri.	To raise the arm.
	2. Supra-spinatus.	From the basis, spine, and upper costa of the scapula.	Into a large tuberosity at the head of the os humeri.	To raise the arm.

(N) In the generality of anatomical books we find these muscles divided into *inter-spinalis cervicis, dorsi*, and *lumborum*, but we do not find any such muscles either in the loins or back.

(O) These muscles are to be found only in the neck and loins; what have been described, as the *inter-transversales dorsi* being rather small tendons than muscles.

(P) This and the following pair of muscles derive their name of *psoas* from ψοα, *lumbus*, on account of their situation at the anterior part of the loins.

(Q) So called from its shape, which is that of an irregular square.

(R) Some of the fibres of this muscle are united with those of the levator ani, so that it assists in closing the lower part of the pelvis.

(S) So named from its supposed resemblance to the Greek Δ reversed.

	Name.	Origin.	Insertion.	Use.
	3. Infra-spinatus.	From the base and spine of the scapula.	Into the upper and middle part of the tuberosity.	To roll the os humeri outwards.
	4. Teres minor (T).	From the inferior costa of the scapula.	Into the lower part of the tuberosity.	To assist the infra spinatus.
	5. Teres major.	From the inferior angle, and inferior costa of the scapula.	Into the ridge at the inner side of the groove formed for the long head of the biceps.	To assist in the rotatory motion of the arm.
	6. Subscapularis.	From the basis, superior and inferior costa of the scapula.	Into the upper part of a small tuberosity at the head of the os humeri.	To roll the arm inwards.
	7. Coraco-brachialis (U)	From the coracoid process of the scapula.	Into the middle and inner side of the os humeri.	To roll the arm forwards and upwards.
Muscles on the os humeri, - -	1. Biceps flexor cubiti.	By two heads, one from the coracoid process, and the other, or long head, from the upper and outer edge of the glenoid cavity of the scapula.	Into the tuberosity at the upper end of the radius.	To bend the fore-arm.
	2. Brachialis internus	From the os humeri, below, and at each side of the tendon of the deltoides.	Into a small tuberosity at the fore part of the coronoid process of the ulna.	To assist in bending the fore-arm.
	3. Triceps extensor cubiti.	By three heads: the first, from the inferior costa of the scapula; the second from the upper and outer part of the os humeri; and the third, from the back part of that bone.	Into the upper and outer part of the olecranon.	To extend the fore-arm.
——— on the fore-arm, - -	1. Supinator longus.	From the outer ridge and anterior surface of the os humeri, a little above its outer condyle.	Into the radius near its styloid process.	To assist in turning the palm of the hand upwards.
	2. Extensor carpi radialis longus.	Immediately below the origin of the supinator longus.	Into the upper part of the metacarpal bone of the fore-finger.	To extend the wrist.
	3. Extensor capri radialis brevis.	From the outer and lower part of the outer condyle of the os humeri, and the upper part of the radius.	Into the upper part of the metacarpal bone of the middle finger.	To assist the extensor longus.
	4. Extensor digitorum communis.	From the outer condyle of the os humeri.	Into the back part of all the bones of the fore finger.	To extend the fingers

5. Extensor

(T) This and the following pair are called *teres*, from their being of a long and round shape.
(U) This muscle affords a passage to the musculo-cutaneous nerve.

Name.	Origin.	Insertion.	Use.
5. Extensor minimi digiti.	From the outer condyle of the os humeri.	Into the bones of the little finger.	To extend the little finger.
6. Extensor carpi ulnaris.	From the outer condyle of the os humeri.	Into the metacarpal bone of the little finger.	To assist in extending the wrist.
7. Anconæus (v).	From the outer condyle of the os humeri.	Into the outer edge of the ulna.	To extend the fore-arm.
8. Flexor carpi ulnaris.	From the inner condyle of the os humeri, and interior edge of the olecranon (w).	Into the os pisiforme.	To assist in bending the hand.
9. Palmaris longus.	From the inner condyle of the os humeri.	Into the internal annular ligament, and aponeurosis palmaris (x).	To bend the hand.
10. Flexor carpi radialis.	From the inner condyle of the os humeri.	Into the metacarpal bone of the fore finger.	To bend the hand.
11. Pronator radii teres.	From the outer condyle of the os humeri, and coronoid process of the ulna.	Into the anterior and convex edge of the radius near its middle.	To roll the hand inwards.
12. Flexor sublimis perforatus (y).	From the inner condyle of the os humeri, inner edge of the coronoid process of the ulna, and upper and anterior part of the radius.	Into the second bone of each finger.	To bend the second joint of the fingers.
13. Supinator radii brevis.	From the outer condyle of the os humeri, and posterior surface and outer edge of the ulna.	Into the anterior, inner, and upper part of the radius.	To roll the radius outwards.
14. Abductor pollicis longus.	From the middle and back part of the ulna, interosseous ligament, and radius.	By two tendons into the os trapezium, and first bone of the thumb.	To stretch the first bone of the thumb outwards.
15. Extensor minor pollicis.	From the back part of the ulna, and interosseous ligament and radius.	Into the convex part of the second bone of the thumb.	To extend the second bone of the thumb obliquely outwards.
16. Extensor major pollicis.	From the back of the ulna and interosseous ligament.	Into the third and last bone of the thumb.	To stretch the thumb obliquely backwards.
17. Indicator.	From the middle of the ulna.	Into the metacarpal bone of the fore-finger.	To extend the fore-finger.

18 Flexor

(v) So called from ἀγκών, *cubitus*.
(w) Between the two origins of this muscle we find the ulnor-nerve going to the fore-arm.
(x) The aponeurosis palmaris is a tendinous membrane that extends over the palm of the hand. Some anatomists have supposed it to be a production of the tendon of this muscle, but without sufficient grounds; for in some subjects we find the palmaris longus inserted wholly into the annular ligament, so as to be perfectly distinct from this aponeurosis; and it now and then happens, that no palmaris longus is to be found, whereas this expansion is never deficient.
(y) This muscle is named *perforatus*, on account of the four tendons in which it terminates, being perforated by those of another muscle, the perforans.

	Name.	Origin.	Insertion.	Use.
	18. Flexor profundus perforans.	From the upper and fore part of the ulna, and interosseous ligament.	Into the fore part of the last bone of each of the fingers.	To bend the last joint of the fingers.
	19. Flexor longus pollicis.	From the upper and fore part of the radius.	Into the last joint of the thumb.	To bend the last joint of the thumb.
	20. Pronator radii quadratus.	From the inner and lower part of the ulna.	Into the radius, opposite to its origin.	To roll the radius inwards, and of course to assist in the pronation of the hand.
MUSCLES on the hand,	1. Lumbricales (z).	From the tendons of the perforans.	Into the tendons of the extensor digitorum communis.	To bend the first, and to extend the two last joints of the fingers (A).
	2. Abductor brevis pollicis.	From the fore part of the internal annular ligament, os scaphoides, and one of the tendons of the abductor longus pollicis.	Into the outer side of the 2d bone of the thumb, near its root.	To move the thumb from the fingers.
	3. Opponens pollicis.	From the inner and anterior part of the internal annular ligament, and from the os scaphoides.	Into the first bone of the thumb.	To move the thumb inwards, and to turn it upon its axis.
	4. Flexor brevis pollicis.	From the os trapezoides, internal annular ligament, os magnum, and os unciforme.	Into the ossa sesamoidea and second bone of the thumb.	To bend the second joint of the thumb.
	5. Abductor pollicis.	From the metacarpal bone of the middle finger.	Into the basis of the second bone of the thumb.	To move the thumb towards the fingers
	6. Abductor indices.	From the inner side of the first bone of the thumb, and from the os trapezium.	Into the first bone of the fore finger posteriorly.	To move the fore finger towards the thumb.
	7. Palmaris brevis.	From the internal annular ligament, and aponeurosis palmaris.	Into the os pisiforme, and the skin covering the abductor minimi digiti.	To contract the palm of the hand.
	8. Abductor minimi digiti.	From the internal annular ligament and os pisiforme.	Into the side of the first bone of the little finger.	To draw the little finger from the rest.
	9. Flexor parvus minimi digiti.	From the os unciforme and internal annular ligament.	Into the first bone of the little finger.	To bend the little finger.
	10. Abductor metacarpi minimi digiti.	From the os unciforme and internal annular ligament.	Into the metacarpal bone of the little finger.	To move that bone towards the rest.
	11. Interossei interni.	Situated between the metacarpal bones.	Into the roots of the fingers.	To extend the fingers and move them towards the thumb (B).

12. Interossei

(z) So named from their being shaped somewhat like the lumbricus or earth-worm.

(A) Fallopius was the first who remarked the two opposite uses of this muscle. Their extending power is owing to their connection with the extensor communis.

(B) The third interosseus internus (for there are four of the externi and three of the interni) differs from the rest in drawing the middle finger from the thumb.

	Name.	Origin.	Insertion.	Use.
	12. Interossei externi.	Situated between the matacarpal bones on the back of the hand.	Into the roots of the fingers.	To extend the fingers; but the first draws the middle finger inwards, the second draws it outwards, and the third draws the ring finger inwards.
Muscles at the back part of the pelvis, and upper part of the thigh, - -	1. Glutæus (c) maximus.	From the spine of the illium, posterior sacro ischiatic ligaments, os sacrum, and os coccygis.	Into the upper part of the *linea aspera* of the os femoris.	To extend the thigh and draw it outwards.
	2. Glutæus medius.	From the spine and superior surface of the ilium.	Into the outer and back part of the great trochanter of the os femoris.	To draw the thigh outwards and a little backwards, and when it is bended, to roll it.
	3. Glutæus minimus.	From the outer surface of the ilium and the border of its great niche.	Into the upper and anterior part of the great trochanter.	To assist the former.
	4. Pyriformis (d).	From the anterior part of the os sacrum.	Into a cavity at the root of the trochanter major.	To roll the thigh outwards.
	5. Gemini (e).	By two portions, one from the outer surface of the spine of the ischium; the other from the tuberosity of the ischium and posterior sacro-ischiatic ligament.	Into the same cavity as the pyriformis.	To roll the thigh outwards, and likewise to confine the tendon of the obturator internus, when the latter is in action.
	6. Obturator internus.	From the superior half of the inner border of the foramen thyroideum.	Into the same cavity with the former.	To roll the thigh outwards.
	7. Quadratus (f) femoris.	From the tuberosity of the ischium.	Into a ridge between the trochanter major and trochanter minor.	To move the thigh outwards.
——— on the thigh (g), - - -	1. Biceps flexor cruris.	By two heads; one from the tuberosity of the ischium,	Into the upper and back part of the fibula (h).	To bend the leg.

(c) From γλουτος, *nates*

(d) So named from its pear-like shape.

(e) The two portions of this muscles having been described as two distinct muscles by some anatomists, have occasioned it to be named *gemini*. The tendon of the obturator internus runs between these two portions

(f) This muscle is not of the square shape its name would seem to indicate.

(g) The muscles of the leg and thigh are covered by a broad tendinous membrane called *fascia lata*, that surrounds them in the manner of a sheath. It is sent off from the tendons of the glutæi and other muscles, and dipping down between the muscles it covers, whereas to the linea aspera, and spreading over the joint of the knee, gradually disappears on the leg. It is thickest on the inside of the thigh.

(h) The tendon of this muscle forms the *outer ham-string*

Name.	Origin.	Insertion.	Use.
	the other from the linea aspera near the insertion of the glutæus maximus.		
2. Semi-tendinosus.	From the tuberosity of the ischium.	Into the upper and inner part of the tibia.	To bend and draw the leg inwards.
3. Semi-membranosus (I).	From the tuberosity of the ischium.	Into the upper and back part of the head of the tibia.	To bend the leg.
4. Tensor vaginæ femoris.	From the superior and anterior spinous process of the ilium.	Into the inner side of the fascia lata, which covers the outside of the thigh.	To stretch the fascia.
5. Sartorius.	From the superior and anterior spinous process of the ilium.	Into the upper and inner part of the tibia.	To bend the leg inwards (K).
6. Rectus.	By two tendons; one from the anterior and inferior spinous process of the ilium; the other from the posterior edge of the cotyloid cavity.	Into the upper and fore-par of the patella.	To extend the leg.
7. Gracilis.	From the fore-part of the ischium and pubis.	Into the upper and inner part of the tibia.	To bend the leg.
8. Vastus externus (L)	From the anterior and lower part of the great trochanter, and the outer edge of the linea aspera.	To the upper and outer part of the patella.	To extend the leg.
9. Vastus internus.	From the inner edge of the linea aspera, beginning between the fore-part of the os femoris and the root of the lesser trochanter.	Into the upper and inner part of the patella.	To extend the leg.
10. Cruræus (M).	From the outer and anterior part of the lesser trochanter.	Into the upper part of the patella.	To extend the leg.
11. Pectinalis.	From the anterior edge of the os pubis, or pectinis, as it is sometimes called.	Into the upper and fore part of the linea aspera.	To draw the thigh inwards, upwards, and to roll it a little outwards.

12. Abductor

(I) So named on account of its origin, which is by a broad flat tendon three inches long.

(K) Spigelius was the first who gave this the name of *sartorius*, or the taylor's muscle, from its use in crossing the legs.

(L) The vastus externus, vastus internus, and cruræus, are so intimately connected with each other, that some anatomists have been induced to consider them as a *triceps*, or single muscle with three heads.

(M) Under the cruræus we sometimes meet with two small muscles, to which Albinus has given the name of *sub-cruræi*. They terminate on each side of the patella, and prevent the capsular ligament from being pinched. When they are wanting, which is very often the case, some of the fibres of the cruræus are found adhering to the capsula.

	Name.	Origin.	Insertion.	Use.
	12. Abductor longus femoris (N).	From the upper and fore part of the os pubis.	Near the middle and back part of the linea aspera.	
	13. Abductor brevis femoris.	From the fore part of the ramus of the os pubis.	Into the inner and upper part of the linea aspera.	To draw the thigh inwards, upwards, and to roll it a little outwards.
	14. Abductor magnus femoris.	From the lower and fore part of the ramus of the os pubis.	Into the whole length of the linea aspera.	
	15. Obturator externus.	From part of the obturator ligament, and the inner half of the circumference of the foramen thyroideum.	Into the os femoris near the root of the great trochanter.	To move the thigh outwards in an oblique direction, and likewise to bend and draw it inwards.
MUSCLES on the leg,	1. Gastrocnemius (O) externus.	By two heads; one from the inner condyle, the other from the outer condyle of the os femoris.	By a great round tendon, common to this and the following muscle.	To extend the foot.
	2. Gastrocnemius (P) internus.	By two heads; one from the back part of the head of the fibula, the other from the upper and back part of the tibia.	By a large tendon (the *tendo achillis*) common to this and the former muscle, into the lower and back part of the os calcis.	To extend the foot.
	3. Plantaris (Q)	From the upper and posterior part of the outer condyle of the os femoris.	Into the inside of the back part of the os calcis.	To assist in extending the foot.
	4. Popliteus (R)	From the outer condyle of the thigh.	Into the upper and inner part of the tibia.	To assist in bending the leg and rolling it inwards.
	5. Flexor longus digitorum pedis (S)	From the upper and inner part of the tibia.	By four tendons, which, after passing through the perforations in those of the flexor digitorum brevis, are inserted into the last bone of all the toes except the great toe.	To bend the last joint of the toe.
	6. Flexor longus pollicis pedis.	From the back part, and a little below the head of the fibula.	Into the last bone of the great toe.	To bend the great toe.

(N) This and the two following muscles have been usually, but improperly, considered as forming a single muscle with three heads, and on that account named *triceps femoris*.

(O) Γαστροκνημια, *sura*, "the calf of the leg."

(P) This muscle is by some anatomists named *soleus*, on account of its being shaped like the sole-fish.

(Q) This muscle has gotten the name of *plantaris*, from its being supposed to furnish the aponeurosis that covers the sole of the foot; but it does not in the least contribute to the formation of that tendinous expansion.

(R) So called on account of its situation at the ham (*poples*).

(S) This muscle, about the middle of the foot, unites with a fleshy mass, which, from its having first been described by Sylvius, is usualy called *massa carnea* JACOBI SYLVII.

Of the Muscles.

Name.	Origin.	Insertion.	Use.
7. Tibialis posticus.	From the back part and outer edge of the tibia, and likewise from the interosseous ligament and adjacent part of the fibula.	Into the inner and upper part of the os naviculare and side of the os cuneiforme medium.	To move the foot inwards.
8. Peroneus longus.	From the outer side of the head of the tibia, and also from the upper, anterior, and outer part of the *perone* or fibula, to which it adheres for a considerable way down.	Into the metatarsal bone of the great toe.	To move the foot outwards.
9. Peroneus brevis.	From the outer and fore-part of the fibula.	Into the metatarsal bone of the little toe.	To assist the last described muscle.
10. Extensor longus digitorum pedis.	From the upper, outer, and fore part of the tibia, interosseous ligament, and inner edge of the fibula.	By four tendons into the first joint of the smaller toes.	To extend the toes.
11. Peroneus tertius.	From the fore-part of the lower half of the fibula, and from the interosseous ligament.	Into the metatarsal bone of the little toe.	To bend the foot.
12. Tibialis anticus.	From the upper and fore part of the tibia.	Into the os cuneiforme internum.	To bend the foot.
13. Extensor proprius pollicis pedis.	From the upper and fore part of the tibia.	Into the convex surface of the bones of the great toe.	To extend the great toe.
MUSCLES on the foot, 1. Extensor brevis digitorum pedis.	From the upper and anterior part of the os calcis.	By four tendons; one of which joins the tendon of the externus longus pollicis, and the other three the tendons of the extensor digitorum longus.	To extend the toes.
2. Flexor brevis digitorum pedis.	From the lower part of the os calcis.	By four tendons, which, after affording a passage to those of the flexor longus, are inserted into the second phalanx of each of the small toes.	To bend the second joint of the toes.
3. Abductor pollicis pedis.	From the inner and lower part of the os calcis.	Into the first joint of the great toe.	To move the great toe from the other toes.
4. Abductor minimi digiti.	From the outer tubercle of the os calcis, the root of the metatarsal bone of the little toe, and also from the aponeurosis plantaris.	Into the outer side of the first joint of the little toe.	To draw the little toe outwards.

5. Lumbricales

Name.	Origin.	Insertion.	Use.
5. Lumbricalis pedis.	From the tendons of the flexor longus digitorum pedis.	Into the tendinous expansion at the upper part of the toes.	To draw the toes inwards.
6. Flexor brevis pollicis pedis.	From the inferior and anterior part of the os calcis, and also from the inferior part of the os cuneiforme externum	By two tendons into the first joint of the great toe.	To bend the first joint of the great toe.
7. Adductor pollicis pedis.	From near the roots of the metatarsal bones of the 2d, 3d, and 4th toes.	Into the outer os sesamoideum, or first joint of the great toe.	To draw the great toe nearer to the rest, and also to bend it.
8. Transversales pedis.	From the outer and under part of the anterior end of the metatarsal bone of the little toe.	Into the inner os sesamoideum, and anterior end of the metatarsal bone of the great toe.	To contract the foot.
9. Flexor brevis minimi digiti pedis.	From the basis of the metatarsal bone of the little toe.	Into the first joint of the little toe.	To bend the little toe.
10. Interossei pedis interni (T). ———— externi (U).	Situated between the metatarsal bones.		

EXPLANATION OF PLATES XXIII. AND XXIV.

Plate XXIII.

Fig. 1. The Muscles immediately under the common teguments on the anterior part of the body are represented on the right side; and on the left side the Muscles are seen which come in view when the exterior ones are taken away.

A, The frontal muscle. B, The tendinous aponeurosis which joins it to the occipital; hence both named *occipito-frontalis*. C, Attolens aurem. D, The ear. E, Anterior auris. F F, Orbicularis palpebrarum. G, Levator labii superioris alæque nasi. H, Levator anguli oris. I, Zygomaticus minor. K, Zygomaticus major. L, Masseter. M, Orbicularis oris. N, Depressor labii inferioris. O, Depressor anguli oris. P, Buccinator. Q Q, Platysma myoides. R R, Sterno-cleido-mastoidæus. S, Part of the trapezius. T, Part of the scaleni.

Superior Extremity.—U, Deltoides. V, Pectoralis major. W, Part of the latissimus dorsi. X X, Biceps flexor cubiti. Y Y, Part of the brachialis externus. Z Z, The beginning of the tendinous aponeurosis (from the biceps), which is spread over the muscles of the fore-arm. a a, Its strong tendon inserted into the tubercle of the radius. b b, Part of the brachialis internus. c, Pronator radii teres. d, Flexor carpi radialis. e, Part of the flexor carpi ulnaris. f, Palmaris longus. g, Aponeurosis palmaris. 3. Palmaris brevis. 1, Ligamentum carpi annulare. 2 2, Abductor minimi digiti. h. Supinator radii longus. i, The tendons of the thumb. k, Adductor pollicis. l, Flexor pollicis longus. m m, The tendons of the flexor sublimis perforatus, profundus perforans, and lumbricales.—The sheaths are entire in the right hand,—in the left cut open to show the tendons of the flexor profundus perforating the sublimis.

Muscles not referred to—in the left superior extremity.—n, Pectoralis minor, seu serratus anticus minor. o, The two heads of (x x) the biceps. p, Coraco-brachialis. q q, The long head of the triceps extensor cubiti. r r, Teres major. s s, Subscapularis. t t, Extensores radiales. u, Spinator brevis. v, The cut extremity of the pronator teres. w, Flexor sublimis perforatus. x, Part of the flexor profundus. y, Flexor pollicis longus. z. Part of the flexor pollicis brevis. 4. Abductor minimi digiti. 5. The four lumbricales.

Trunk.—6, Serrated extremities of the serratus anticus major. 7 7, Obliquus externus abdominis. 8 8, The linea alba. 9, The umbilicus. 10. Pyramidalis. 11 11, The spermatic cord. On the left side it is covered by the cremaster. 12 12, Rectus abdominis. 13, Obliquus internus. 14 14, &c. Intercostal muscles.

Inferior Extremities.—*a a*, The gracilis. *b b*, Parts of the triceps. *c c*, Pectialis. *d d*, Psoas magnus. *e e*, Iliacus internus. *f*, Part of the glutæus medius. *g*, Part of the glutæus minimus. *h*, Cut extremity of the rectus cruris. *i i*, Vastus externus. *k*, Tendon of the rectus cruris. *l l*, Vastus internus.

 * Sartorius

(T) The interossei interni are three in number; their use is to draw the smaller toes towards the great toe.

(U) The interossei externi are four in number; the first serves to move the fore-toe towards the great toe: the rest moves the toes outwards. All the interossei assist in extending the toes.

* Sartorius muscle. ** Fleshy origin of the tensor vaginæ fæmoris or membranosus. Its tendinous aponeurosis covers *(i)* the vastus externus on the right side. *m m*, Patella. *n n*, Ligament or tendon from it to the tibia. *o*, Rectus cruris. *p*, Cruræus. *q q*, The tibia. *r r*, Part of the Gemellus or gastrocnemius externus. *s s s*, Part of the soleus or gastrocnemius internus. *t*, Tibialis anticus. *u*, Tibialis posticus. *v v*, Peronæi muscles. *w w*, Extensor longus digitorum pedis. *x x*, Extensor longus pollicis pedis. *y*, Abductor pollicis pedis.

FIG. 2. The MUSCLES, GLANDS, &c. of the Left Side of the face and neck, after the common Teguments and Platysma myoides have been taken off.

a, The frontal muscle. b, Temporalis and temporal artery. c, Orbicularis palpebrarum. d, Levator labii superioris alæqui nasi. e, Levator anguli oris. f, Zygomaticus. g, depressor labii inferioris. h, Depressor anguli oris. i, Buccinator. k, Masseter. l l, Parotid gland. m, Its duct. n, Sterno-cleido-mastoidæus. o, Part of the trapezius. p, Sterno-hyoidæus. q, Sterno-thyroidæus. r, Omo-hyoidæus. s, Levator scapulæ. t t, Scaleni. u, Part of the splenius.

FIG. 3, The MUSCLES of the Face and Neck in view after the exterior ones are taken away.

a a, Corrugator supercilii. b. Temporalis. c, Tendon of the levator palpebræ superioris. d, Tendon of the orbicularis palpebrarum. e, Masseter. f, Buccinator. g, Levator anguli oris. h, Depressor labii superioris alæque nasi. i, Orbicularis oris. k, Depressor anguli oris. l, Muscles of the os hyoides. m, Sterno-cleido-mastoidæus.

FIG. 4. Some of the MUSCLES of the Os Hyoides and Submaxillary Gland.

a, Part of the masseter muscle. b, Posterior head of the digastric. c, Its anterior head. d d, Sterno-hyoidæus. e. Omo-hyoidæus. f, Stylo-hyoidæus. g, Submaxillary gland in situ.

FIG. 5. The Submaxillary Gland and Duct.

a, Musculus mylo-hyoidæus. b, Hyo-glossus. c, Submaxillary gland extra situ. d, Its duct.

PLATE XXIV.

FIG. 1. The MUSCLES immediately under the common teguments on the posterior part of the body, are represented in the right side; and on the left side the MUSCLES are seen which come in view when the exterior ones are taken away.

HEAD.—A A, Occipito-frontalis. B, Attollens aurem. C, Part of the orbicularis palpebrarum. D, Masseter. E, Pterygoidæus internus.

TRUNK.—Right side. F F F, Trapezius seu cucullaris. G G G G, Latissimus dorsi. H, Part of the obliquus externus abdominis.

TRUNK.—Left side. I, Splenius. K, Part of the complexus. L, Levator scapulæ. M, Rhomboides. N N, Seratus posticus inferior. O, Part of the longissimus dorsi. P, Part of the sacro-lumbalis. Q, Part of the semi-spinalis dorsi. R, Part of the serratus anticus major. S, Part of the obliquus internus abdominis.

SUPERIOR EXTREMITY.—Right side. T, Deltoides U, Triceps extensor cubiti. V, Supinator longus. W W, Extensores carpi radialis longior and brevior. X X, Extensor carpi ulnaris. Y Y, Extensor digitorum communis. Z, Abductor indicis. 1 2 3, Extensores pollicis.

SUPERIOR EXTREMITY.—Left side. a, Supra spinatus. b, Infra-spinatus. c, Teres minor. d, Teres major. e, Triceps extensor cubiti. f f, Extensores carpi radiales. g, Supinator brevis. h, Indicater. 1 2 3, Extensores pollicis. i, Abductor minimi digiti. k, Interossei.

INFERIOR EXTREMITY.—Right side. l, Glutæus maximus. m, Part of the Glutæus medius. n, Tensor vaginæ femoris. o, Gracilis. p p, Abductor femoris magnus. q, Part of the vastus internus. r, Semimembranosus. s, Semitendinosus. t, Long head of the biceps flexor cruris. u u, Gastrocnemius externus seu gemellus. v, Tendo Achillis. w, Soleus seu gastrocnemius internus, x x, Peronæus longus and brevis. y, Tendons of the flexor longus digitorum pedis;—and under them * flexor brevis digitorum pedis. z, Abductor minimi digiti pedis.

INFERIOR EXTREMITY.—Left side. *m*, *n*, *o*, *p p*, *q*, *r*, *s*, *t*, *v*, *w w*, *x x*, *y*, *z*, Point the same parts as in the right side. *a*, Pyriformis. *b b*, Gemini. *c c*, Obturator internus. *d*, Quadratus femoris. *e*, Coccygæus. *f*, The short head of the biceps flexor cruris. *g g*, Plantaris. *h*, Poplitæus. *i*, Flexor longus pollicis pedis.

FIG. 2. The Palm of the Left Hand after the common Teguments are removed, to show the MUSCLES of the Fingers.

a, Tendon of the flexor carpi radialis. b, Tendon of the flexor carpi ulnaris. c, Tendons of the flexor sublimis perforatus, profundus perforans and lumbricales. d, Abductor policis. e e, Flexor policis longus. f, Flexor policis brevis. g, Palmaris brevis. h, Abductor minimi digiti. i, Ligamentum carpiannulare. k, A probe put under the tendons of the flexor digitorum sublimis; which are performed by l, the flexor digitorum profundus. m m m m, Lumbricales. n, Abductor pollicis.

FIG. 3. A fore-view of the foot and Tendons of the Flexores Digitorum.

a, Cut extremity of the tendo Achillis. b, Upper part of the astragalus. c, Os calcis. d, Tendon of the tibialis anticus. e, Tendon of the extensor pollicis longus. f, Tendon of the peronæus brevis. g, Tendons of the flexor digitorum longus, with the nonus Vesalii. h h, The whole of the flexor digitorum brevis.

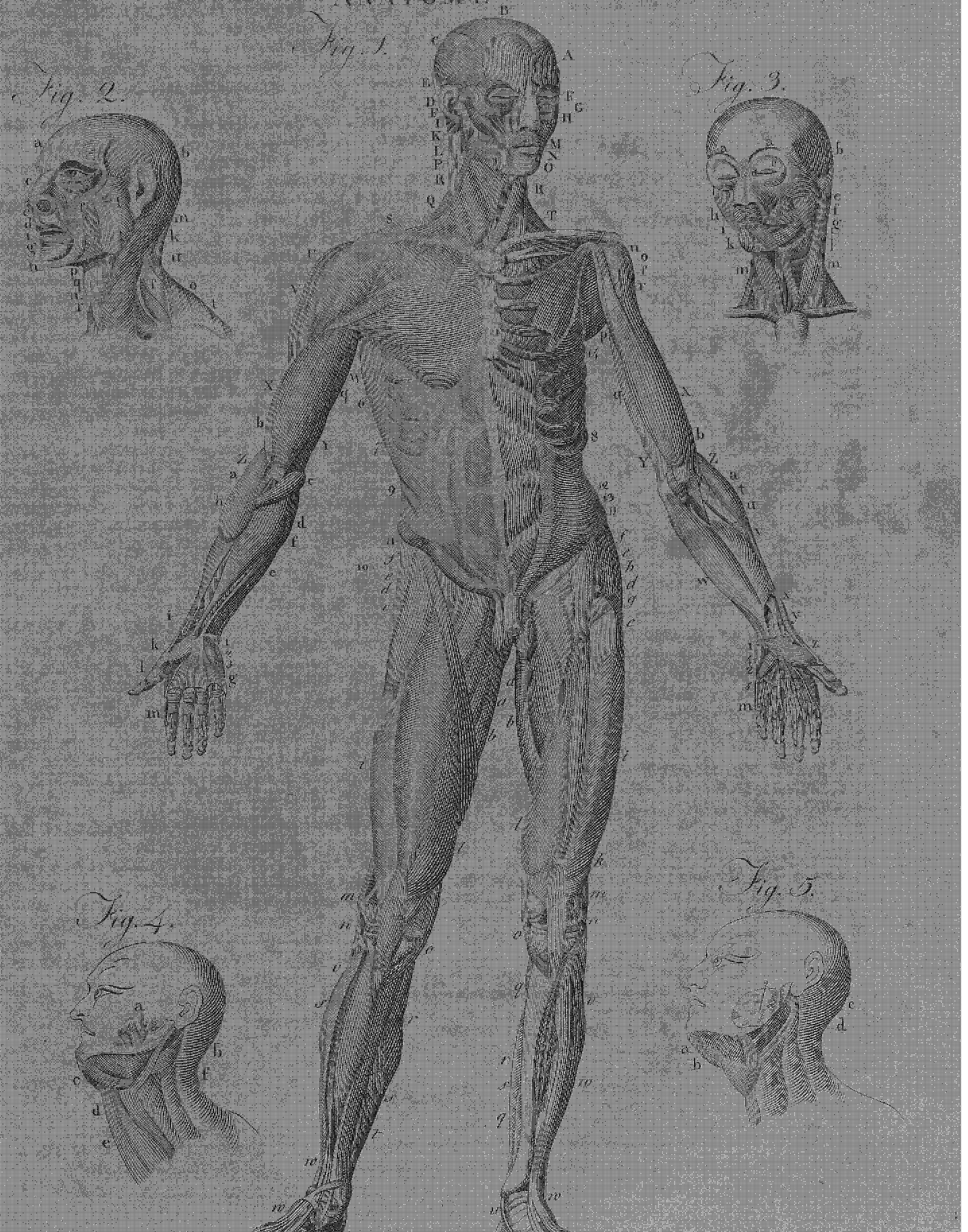
FIG. 4. MUSCLES of the Anus.

a a, An out line of the buttocks, and upper part of the thighs. b, The testes contained in the scrotum. c c, Sphincter ani. d, Anus. e, Levator ani. f f, Erector penis. g g, Accelerator urinæ. h, Corpus cavernosum urethæ.

FIG. 5. MUSCLES of the Penis.

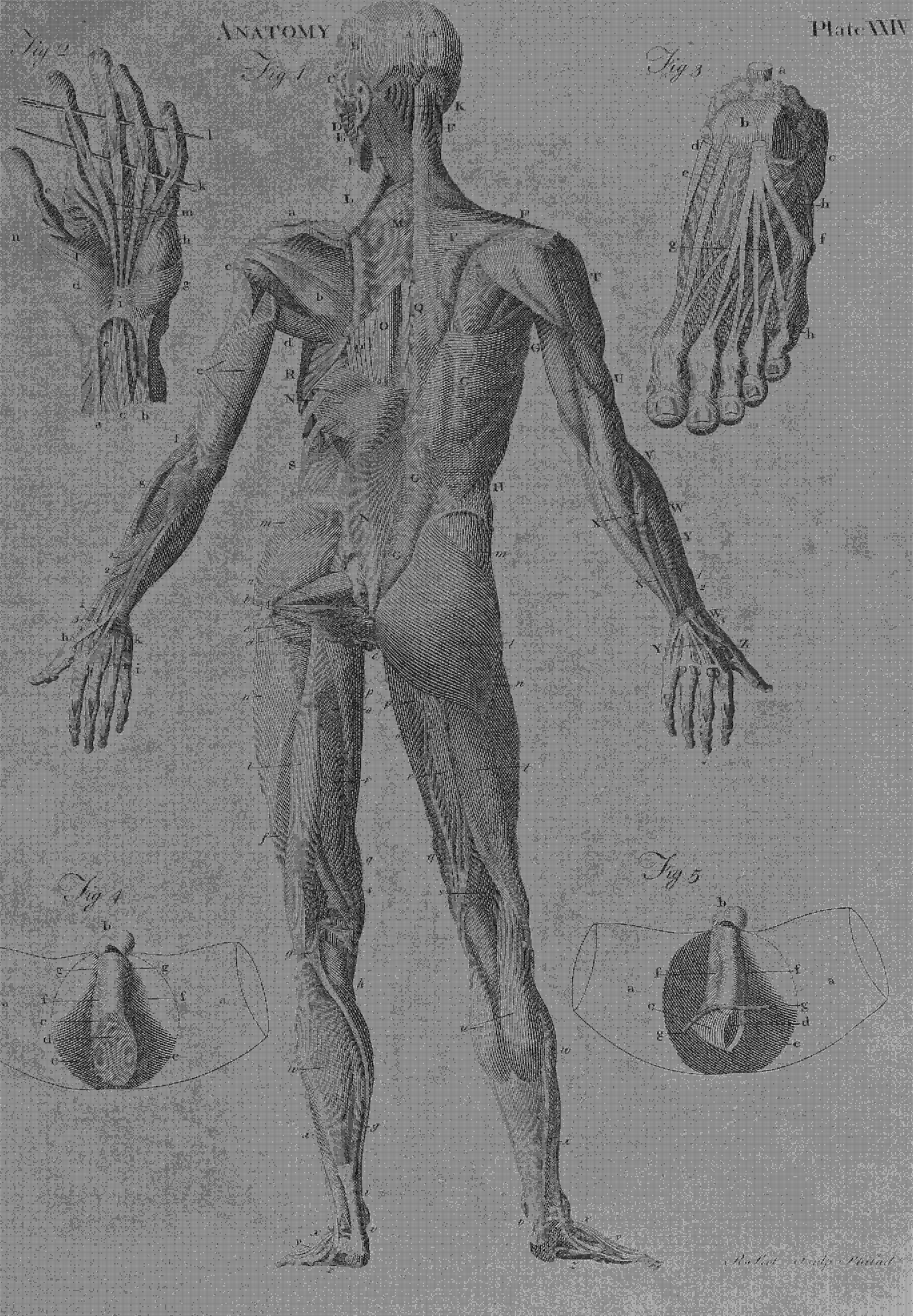
a a, b, d, e e, f f, h, point the same as in fig. 4. c, Sphincter ani. g g, Transversalis penis.

ANATOMY. Plate XXIII



ANATOMY

Plate XXIV



PART III. OF THE ABDOMEN OR LOWER BELLY.

88. THE abdomen, or lower belly, extends from the lower extremity of the ſternum, or the hollow, uſually called the pit of the ſtomach, and more properly *ſcrobiculus cordis*, to the lower part of the trunk.

It is diſtinguiſhed into three diviſions called *regions*; of theſe the upper one, which is called the *epigaſtric region*, begins immediately under the ſternum, and extends to within two fingers breadth of the navel, where the middle or *umbilical region* begins, and reaches to the ſame diſtance below the navel. The third, which is called the *hypogaſtric*, includes the reſt of the abdomen, as far as the os pubis.

Each of theſe regions is ſubdivided into three others; two of which compoſe the ſides, and the other the middle part of each region.

The middle part of the upper region is called *epigaſtrium*, and its two ſides *hypochondria*. The middle part of the next region is the umbilical region, properly ſo called, and its two ſides are the flanks, or iliac regions. Laſtly, the middle part of the lower region retains the name of hypogaſtrium, and its ſides are called inguina or groins. The back part of the abdomen bears the name uf lumbar region.

Theſe are the diviſions of the lower belly, which are neceſſary to be held in remembrance, as they frequently occur in ſurgical and anatomical writing. We will now proceed to examine the contents of the abdomen; and after having pointed out the names and arrangement of the ſeveral viſcera contained in it, deſcribe each of them ſeparately.

After having removed the ſkin, adipoſe membrane, and abdominal muſcles, we diſcover the peritonæum or membrane that envelopes all the viſcera of the lower belly. This being opened, the firſt part that preſents itſelf is the omentum or cawl, floating on the ſurface of the inteſtines, which are likewiſe ſeen every where looſe and moiſt, and making a great number of circumvolutions through the whole cavity of the abdomen. The ſtomach is placed in the epigaſtrium, and under the ſtomach is the pancreas. The liver fills the right hypochondrium, and the ſpleen is ſituated in the left. They kidneys are ſeen about the middle of the lumbar region, and the urinary bladder and parts of generation are ſeated in the lower diviſion of the belly.

SECT. I. *Of the Peritonæum.*

89. THE peritonæum is a ſtrong ſimple membrane, by which all the viſcera of the abdomen are ſurrounded, and in ſome meaſure ſupported. Many anatomical writers, particularly Winſlow, have deſcribed it as being compoſed of two diſtinct membranous laminæ; but their deſcription ſeems to be erroneous. What perhaps appeared to be a ſecond lamina, being found to be ſimply a cellular coat, which ſends off productions to the blood-veſſels paſſing out of the abdominal cavity. The aorta and vena cava likewiſe derive a covering from the ſame membrane, which ſeems to be a part of the cellular membrane we have already deſcribed.

The peritonæum, by its productions and reduplications, envelopes the greateſt part of the abdominal viſcera. It is ſoft, and capable of conſiderable extenſion; and is kept ſmooth and moiſt by a vapour, which is conſtantly exhaling from its inner ſurface, and is returned again into the circulation by the abſorbents.

This moiſture not only contributes to the ſoftneſs of the peritonæum, but prevents the attrition, and other ill effects which would otherwiſe probably be occaſioned, by the motion of the viſcera upon each other.

When this fluid is ſupplied in too great a quantity, or the abſorbents become incapable of carrying it off, it accumulates, and conſtitutes an aſcites or dropſy of the belly; and when by any means the exhalation is diſcontinued, the peritonæum thickens, becomes diſeaſed, and the viſcera are ſometimes found adhering to each other.

The peritonæum is not a very vaſcular membrane. In a ſound ſtate it ſeems to be endued with little or no feeling, and the nerves that paſs through it appear to belong to the abdominal muſcles.

SECT. II. *Of the Omentum*

THE omentum, epiploon, or cawl, is a double membrane, produced from the peritonæum. It is interlarded with fat, and adheres to the ſtomach, ſpleen, duodenum, and colon; from thence hanging down looſe and floating on the ſurface of the inteſtines. Its ſize is different in different ſubjects. In ſome it deſcends as low as the pelvis, and it is commonly longer at the left ſide than the right. 90.

This part, the ſituation of which we have juſt now deſcribed, was the only one known to the ancients under the name of *epiploon*; but at preſent we diſtinguiſh three omenta, viz. *omentum magnum colico gaſtricum*, *omentum parvum hepatico gaſtricum*, and *omentum colicum*. They all agree in being formed of two very delicate laminæ, ſeparated by a thin layer of cellular membrane.

The omentum magnum colico gaſtricum, of which we have already ſpoken, derives its arteries from the ſplenic and hepatic. Its veins terminate in the vena portæ. Its nerves, which are very few, come from the ſplenic and hepatic plexus.

The omentum parvum hepatico gaſtricum, abounds leſs with fat than the great epiploon. It begins at the upper part of the duodenum, extends along the leſſer curvature of the ſtomach as far as the œſophagus, and terminates about the neck of the gall-bladder, and behind the left ligament of the liver, ſo that it covers the leſſer lobe; near the beginning of which we may obſerve a ſmall opening, firſt deſcribed by Winſlow, through which the whole pouch may eaſily be diſtend-
ed

Of the Abdomen.

ed with air (x). The vessels of the omentum parvum are derived chiefly from the coronary stomachic arteries and veins.

The omentum colicum begins at the fore part of the cœcum and right side of the colon. It appears as a hollow conical appendage to these intestines, and usually terminates at the back of the omentum magnum. It seems to be nothing more than a membranous coat of the cœcum and colon, assuming a conical shape when distended with air.

The uses of the omentum are not yet satisfactorily determined. Perhaps by its softness and looseness it may serve to prevent those adhesions of the abdominal viscera, which have been found to take place when the fat of the omentum has been much wasted. Some authors have supposed, that it assists in the preparation of bile; but this idea is founded merely on conjecture.

Sect. III. *Of the Stomach.*

91 The stomach is a membranous and muscular bag, in shape not unlike a bagpipe, lying across the upper part of the abdomen, and inclining rather more to the left than the right side.

It has two orifices, one of which receives the end of the œsophagus, and is called the *cardia*, and sometimes the left and upper orifice of the stomach; though its situation is not much higher than the other, which is styled the right and inferior orifice, and more commonly the *pylorus*; both these openings are more elevated than the body of the stomach.

The aliment passes down the œsophagus into the stomach through the cardia, and after having undergone the necessary digestion, passes out at the pylorus where the intestinal canal commences,

The stomach is composed of four tunics or coats, which are so intimately connected together that it requires no little dexterity in the anatomist to demonstrate them. The exterior one is membranous, being derived from the peritonæum.—The second is a muscular tunic, composed of fleshy fibres which are in the greatest number about the two orifices.—The third is called the nervous coat, and within this is the villous or velvet-like coat which composes the inside of the stomach.

The two last coats being more extensive than the two first, form the folds, which are observed every where in the cavity of this viscus, and more particularly about the pylorus; where they seem to impede the too hasty exclusion of the aliment, making a considerable plait, called *valvula pylori*.

The inner coat is constantly moistened by a mucus, which approaches to the nature of the saliva, and is called the gastric juice; this liquor has been supposed to be secreted by certain minute glands (y) seated in the nervous tunic, whose excretory ducts open on the surface of the villous coat.

3

The arteries of the stomach called the gastric arteries are principally derived from the cœliac; some of its veins pass to the splenic, and others to the vena portæ; and its nerves are chiefly from the eighth pair or par vagum.

The account given of the tunics of the stomach may be applied to the whole alimentary canal; for both the œsophagus and intestines are, like this viscus, composed of four coats.

Before we describe the course of the aliment and the uses of the stomach, it will be necessary to speak of other parts which assist in the process of digestion.

Sect. IV. *Of the Oesophagus.*

The œsophagus or gullet is a membranous and muscular canal, extending from the bottom of the mouth to the upper orifice of the stomach.—Its upper part where the aliment is received is shaped somewhat like a funnel, and is called the *pharynx*. 92

From hence it runs down close to the bodies of the vertebræ as far as the diaphragm, in which there is an opening through which it passes, and then terminates in the stomach about the eleventh or twelfth vertebra of the back.

The œsophagus is plentifully supplied with arteries from the external carotid, bronchial, and superior intercostal arteries; its veins empty themselves into the vena azygos, internal jugular, and mammary veins, &c.

Its nerves are derived chiefly from the eighth pair.

We likewise meet with a mucus in the œsophagus, which every where lubricates its inner surface, and tends to assist in deglutition.—This mucus seems to be secreted by very minute glands, like the mucus in other parts of the alimentary canal.

Sect. V. *Of the Intestines.*

The intestines form a canal, which is usually six times longer than the body to which it belongs. This canal extends from the pylorus, or inferior orifice of the stomach, to the anus. 93

It will be easily understood, that a part of such great length must necessarily make many circumvolutions, to be confined with so many other viscera within the cavity of the lower belly.

Although the intestines are in fact, as we have observed, only one long and extensive canal, yet different parts have been distinguished by different names.

The intestines are first distinguished into two parts, one of which begins at the stomach, and is called the *thin*, or *small intestines*, from the small size of the canal when compared with the other part, which is called the *large intestines*, and includes the lower portion of the canal down to the anus.

Each of these parts has its subdivisions.—The small in-

(x) This membranous bag, though exceedingly thin and transparent, is found capable of supporting mercury, thrown into it by the same channel.

(y) Heister, speaking of these glands, very properly says, "in *porcis* facile, in *homine* raro observantur;" for although many anatomical writers have described their appearance and figure, yet they do not seem to have been hitherto satisfactorily demonstrated in the human stomach; and the gastric juice is now more generally believed to be derived from the exhalant arteries of the stomach.

intestines being distinguished into duodenum, jejunum, and ilium, and the larger portion into cœcum, colon, and rectum.

The small intestines fill the middle and fore parts of the belly, while the large intestines fill the sides and both the upper and the lower parts of the cavity.

The duodenum, which is the first of the small intestines, is so called, because it is about 12 inches long. It begins at the pylorus and terminates in the jejunum, which is a part of the canal observed to be usually more empty than the other intestines.—This appearance gives it its name, and likewise serves to point out where it begins.

The next division is the ilium, which of itself exceeds the united length of the duodenum and jejunum, and has received its name from its numerous circumvolutions. The large circumvolution of the ilium covers the first of the large intestines called the *cæcum* (x), which seems properly to belong to the colon, being a kind of pouch of about four fingers in width, and nearly of the same length, having exteriorly a little appendix, called *appendix cæci*.

The cœcum is placed in the cavity of the os ilium on the right side, and terminates in the colon, which is the largest of all the intestines.

This intestine ascends by the right kidney to which it is attached, passes under the hollow part of the liver, and the bottom of the stomach, to the spleen, to which it is likewise secured, as it is also to the left kidney; and from thence passes down towards the os sacrum, where, from its straight course, the canal begins to take the name of *rectum*.

There are three ligamentous bands extending thro' the whole length of the colon, which, by being shorter than its two inner coats, serve to increase the plaits on the inner surface of this gut.

The *anus* which terminates the intestinum rectum, is furnished with three muscles; one of these is composed of circular fibres, and from its use in shutting the passage of the anus is called *sphincter ani*.

The other two are the *levatores ani*, so called, because they elevate the anus after dejection. When these by palsy, or any other disease, lose the power of contracting, the anus prolapses; and when the sphincter is affected by similar causes, the fæces are voided involuntarily.

It has been already observed, that the intestinal canal is composed of four tunics; but it remains to be remarked, that here, as in the stomach, the two inner tunics being more extensive than the other two, from the plaits which are to be seen in the inner surface of the intestines, and are called *valvulæ conniventes*.

Some authors have considered these plaits as tending to retard the motion of the fæces, in order to afford more time for the separation of the chyle; but there are others who attribute to them a different use: they contend, that these valves, by being naturally inclined downwards, cannot impede the descent of the fæces, but that they are intended to prevent their return upwards.

They are probably destined for both these uses; for although these folds incline to their lower side, yet the inequalities they occasion in the canal are sufficient to retard, in some measure, the progressive motion of the fæces, and to afford a greater surface for the absorption of chyle, and their natural position seems to oppose itself to the return of the aliment.

Besides these *valvulæ conniventes*, there is one more considerable than the rest, called the *valve of the colon*; which is found at that part of the canal where the intestinum ilium is joined to the colon. This valve permits the alimentary pulp to pass downwards, but serves to prevent its return upwards; and it is by this valve, that glysters are prevented from passing into the small intestines (y).

Of the little vermiform appendix of the cœcum, it will be sufficient to say, that its uses have never yet been ascertained. In birds we meet with two of these appendices.

The intestines are lubricated by a constant supply of mucus, which is probably secreted by very minute follicles (z). This mucus promotes the descent of the alimentary pulp, and in some measure defends the inner surface of the intestines from the irritation to which it would, perhaps, otherwise be continually exposed from the aliment; and which, when in a certain degree, excites a painful disorder called *colic*, a name given to the disease, because its most usual seat is in the intestinum colon.

The intestines are likewise frequently distended with air, and this distention sometimes occasions pain, and constitutes the flatulent colic.

The arteries of the intestines are continuations of the mesenteric arteries, which are derived in two considerable branches from the aorta.—The redundant blood is carried back into the vena portarum.

In the rectum the veins are called *hemorrhoidal*, and are there distinguished into internal and external: the first are branches of the inferior mesenteric vein, but the latter pass into other veins. Sometimes these veins are distended with blood from obstructions, from weakness of their coats, or from other causes, and what we call the *hæmorrhoids* takes place. In this disease they are sometimes ruptured; and the discharge of blood which

(x) Anatomists have differed with respect to this division of the intestines.—The method here followed is now generally adopted; but there are authors who allow the name of *cæcum* only to the little appendix, which has likewise been called the *vermiform appendix*, from its resemblance to a worm in size and length.

(y) This is not invariably the case, for the contents of a glyster have been found not only to reach the small intestines, but to be voided at the mouth. Such instances, however, are not common.

(z) Some writers have distinguished these glands into miliary, lenticular, &c.—Brunner and Peyer were the first anatomists who described the glands of the intestines, and their descriptions were chiefly taken from animals, these glandular appearances not seeming to have been hitherto satisfactorily pointed out in the human subject.—It is now pretty generally believed, that the mucus which every where lubricates the alimentary canal, is exhaled from the minute ends of arteries; and that these extremities first open into a hollow vesicle, from whence the deposited juice of several branches flows out through one common orifice.

which consequently follows, has probably occasioned them to be called *hæmorrhoidal veins*.

The nerves of the intestines are derived from the eighth pair.

Sect. VI. *Of the Mesentery.*

94. The name of the *mesentery* implies its situation amidst the intestines. It is in fact a part of the peritonæum, being a reduplication (A) of that membrane from each side of the lumbar vertebræ, to which it is firmly attached, so that it is formed of two laminæ, connected to each other by cellular membrane.

The intestines, in their different circumvolutions, form a great number of arches, and the mesentery accompanies them through all these turns; but by being attached only to the hollow part of each arch, it is found to have only a third of the extent of the intestines.

That part of this membrane which accompanies the small intestines is the *mesentery*, properly so called; but those parts of it which are attached to the colon and rectum are distinguished by the names of *meso-colon* and *meso-rectum*.

There are many conglobate glands dispersed thro' this double membrane, through which the lacteals and lymphatics pass in their way to the thoracic duct. The blood-vessels of the mesentery were described in speaking of the intestines.

This membrane, by its attachment to the vertebræ, serves to keep the intestines in their natural situation. The idea usually formed of the colic called *miserere*, is perfectly erroneous; it being impossible that the intestines can be twisted, as many suppose they are, in that disease, their attachment to the mesentery effectually preventing such an accident—but a disarrangement sometimes takes place in the intestinal canal itself, which is productive of disagreeable and sometimes fatal consequences.—This is by an introsusception of the intestine, an idea of which may be easily formed, by taking the finger of a glove, and involving one part of it within the other.

If inflammation takes place, the stricture in this case is increased, and the peristaltic motion of the intestines (by which is meant the progressive motion of the fæces downwards) is inverted, and what is called the *iliac passion* takes place. The same effects may be occasioned by a descent of the intestine, or of the omentum either with it or by itself, and thus constituting what is called an *hernia* or *rupture*; a term by which in general is meant the falling down or protrusion of any part of the intestine or omentum, which ought naturally to be contained within the cavity of the belly.

To convey an idea of the manner in which such a descent takes place, it will be necessary to observe, that the lower edge of the tendon of the musculus obliquus externus, is stretched from the fore-part of the os ilium or haunch-bone of the os pubis, and constitutes what is called *Poupart's* or *Fallopius's ligament*, forming an opening, through which pass the great crural artery and vein. Near the os pubis the same tendinous fibres are separated from each other, and form an opening on each side, called the *abdominal ring*, through which the spermatic vessels pass in men, and the ligamenta uteri in women. In consequence of violent efforts, or perhaps of natural causes, the intestines are found sometimes to pass through these openings; but the peritonæum which incloses them when in their natural cavity, still continues to surround them even in their descent. This membrane does not become torn or lacerated by the violence, as might be easily imagined; but its dilatability enables it to pass out with the viscus, which it incloses as it were in a bag, and thus forms what is called the *hernial sac*.

If the hernia be under Poupart's ligament, it is called *femoral*; if in the groin, *inguinal* (B); and *scrotal*, if in the scrotum. Different names are likewise given to the hernia as the contents of the sac differ, whether of omentum only or intestine, or both:—but these definitions more properly belong to the province of surgery.

Sect. VII. *Of the Pancreas.*

The pancreas is a conglomerate gland placed behind the bottom of the stomach, towards the first vertebra of the loins; shaped like a dog's tongue, with its point stretched out towards the spleen, and its other end extending towards the duodenum. It is about eight fingers breadth in length, two or three in width, and one in thickness. 95.

This viscus, which is of a yellowish colour, somewhat inclined to red, is covered with a membrane which it derives from the peritonæum. Its arteries, which are rather numerous than large, are derived chiefly from the splenic and hepatic, and its veins pass into the veins of the same name.—Its nerves are derived from the intercostal.

The many little glands of which it has been observed the pancreas is composed, all serve to secrete a liquor called the *pancreatic juice*, which in its colour, consistence, and other properties, does not seem to differ from the saliva. Each of these glands sends out a little excretory duct, which, uniting with others, help to form larger ducts; and all these at last terminate in one common excretory duct (first discovered by Virtsungus in

(A) He who only reads of the reduplication of membranes, will perhaps not easily understand how the peritonæum and pleura are reflected over the viscera in their several cavities; for one of these serves the same purposes in the thorax that the other does in the abdomen. This disposition, for the discovery of which we are indebted to modern anatomists, constitutes a curious part of anatomical knowledge: but the student, unaided by experience, and assisted only by what the limits of this work would permit us to say on the occasion, would probably imbibe only confused ideas of the matter; and it will perfectly answer the present purpose, if he considers the mesentery as a membrane attached by one of its sides to the lumbar vertebræ, and by the other to the intestines.

(B) The hernia congenita will be considered with the male organs of generation, with which it is intimately connected.

Of the Abdomen. in 1642), which runs through the middle of the gland, and is now usually called *ductus pancreaticus Virtsungi.* This canal opens into the intestinum duodenum, sometimes by the same orifice with the biliary duct, and sometimes by a distinct opening. The liquor it discharges being of a mild and insipid nature, serves to dilute the alimentary pulp, and to incorporate it more easily with the bile.

Sect. VIII. *Of the Liver.*

96. The liver is a viscus of considerable size, and of a reddish colour; convex superiorly and anteriorly where it is placed under the ribs and diaphragm, and of an unequal surface posteriorly. It is chiefly situated in the right hypochondrium, and under the false ribs; but it likewise extends into the epigastric region, where it borders upon the stomach. It is covered by a production of the peritonæum, which serves to attach it by three of its reduplications to the false ribs. These reduplications are called *ligaments,* though very different in their texture from what are called by the same name in other parts of the body. The umbilical cord, too, which in the fœtus is previous, gradually becomes a simple ligament after birth; and, by passing to the liver, serves likewise to secure it in its situation.

At the posterior part of this organ where the umbilical vessels enter, it is found divided into two lobes. Of these, the largest is placed in the right hypochondrium; the other, which covers part of the stomach, is called the *little lobe.* All the vessels which go to the liver pass in at the fissure we have mentioned; and the production of the peritonæum, which invests the liver, was described by Glisson, an English anatomist, as accompanying them in their passage, and surrounding them like a glove; hence this production has been commonly known by the name of *capsula of Glisson*: but it appears to be chiefly a continuation of the cellular membrane which covers the vena porta ventralis.

The liver was considered by the ancients as an organ destined to prepare and perfect the blood; but later discoveries have proved, that this opinion was wrong, and that the liver is a glandular substance formed for the secretion of the bile.

The blood is conveyed to the liver by the hepatic artery and the vena porta. This is contrary to the mode of circulation in other parts, where veins only serve to carry off the redundant blood: but in this viscus the hepatic artery, which is derived from the cæliac, is principally destined for its nourishment; and the vena porta, which is formed by the union of the veins from most of the abdominal viscera, furnishes the blood from which the bile is chiefly to be separated; so that these two series of vessels serve very distinct purposes. The vena porta, as it is ramified through the liver, performs the office both of a vein and an artery; for like the former it returns the blood from the extremities of arteries, while as the latter it prepares it for secretion.

The nerves of the liver are branches of the intercostal and par vagum. The bile, after being separated from the mass of blood, in a manner of which mention will be made in another place, is conveyed out of this organ by very minute excretory ducts, called *poribiliarii*; these uniting together like the excretory ducts in the pancreas, gradually form larger ones, which at length terminate in a considerable canal called *ductus hepaticus.*

Sect. IX. *Of the Gall-Bladder.*

The gall-bladder is a little membranous bag, shaped like a pear, and attached to the posterior and almost inferior part of the great lobe of the liver. 97.

It has two tunics; of which the exterior one is a production of the peritonæum. The interior, or villous coat, is supplied with a mucus that defends it from the acrimony of the bile. These two coverings are intimately connected by means of cellular membrane, which from its firm glistening appearance has generally been spoken of as a muscular tunic.

The gall-bladder is supplied with blood-vessels from the hepatic arteries. These branches are called the *cystic arteries,* and the cystic veins carry back the blood.

Its nerves are derived from the same origin as those of the liver.

The neck of the gall-bladder is continued in the form of a canal called *ductus cysticus,* which soon unites with the ductus hepaticus we described as the excretory duct of the liver; and forming one common canal, takes the name of *ductus coledochus communis,* through which both the cystic and hepatic bile are discharged into the duodenum. This canal opens into the intestine in an oblique direction, first passing through the exterior tunic, and then piercing the other coats after running between each of them a very little way. This œconomy serves two useful purposes;—to promote the discharge of bile and to prevent its return.

The bile may be defined to be a natural liquid soap, somewhat unctuous and bitter, and of a yellowish colour, which easily mixes with water, oil, and vinous spirits, and is capable of dissolving resinous substances. From some late experiments made by M. Cadet*, it appears to be formed of an animal oil, combined with the alkaline base of sea-salt, a salt of the nature of milk, and a calcareous earth which is slightly ferruginous. 98 Of the bile.

* Mem. de l'Acad. des Sciences. 1767.

Its definition seems sufficiently to point out the uses for which it is intended (c). It blends the alimentary mass, by dividing and attenuating it; corrects the too great disposition to acescency, which the aliment acquires in the stomach; and, finally, by its acrimony, tends to excite the peristaltic motion of the intestines.

After what has been said, it will be conceived that there are two sorts of bile; one of which is derived immediately from the liver through the hepatic duct, and the other from the gall-bladder. These two biles, however, do not essentially differ from each other. The hepatic bile indeed is milder, and more liquid than the cystic, which is constantly thicker and yellower; and

(c) The ancients, who were not acquainted with the real use of the liver, considered the bile as an excrementitious and useless fluid.

Of the Abdomen.

and by being bitterer, seems to possess greater activity than the other.

Every body knows the source of the hepatic bile, that it is secreted from the mass of blood by the liver; but the origin of the cystic bile has occasioned no little controversy amongst anatomical writers. There are some who contend, that it is separated in the substance of the liver, from whence it passes into the gall-bladder through particular vessels. In deer, and in some other quadrupeds, as well as in several birds and fishes, there is an evident communication, by means of particular vessels, between the liver and the gall-bladder. Bianchi, Winslow, and others, have asserted the existence of such vessels in the human subject, and named them *hepaticystic ducts*; but it is certain that no such ducts exist.—In obstructions of the cystic duct, the gall-bladder has been found shrivelled and empty: so that we may consider the gall-bladder as a reservoir of hepatic bile; and that it is an established fact, that the whole of the bile contained in the gall-bladder is derived from the liver; that it passes from the hepatic to the cystic duct, and from that to the gall-bladder. The difference in the colour, consistence, and taste of the bile, is merely the consequence of stagnation and absorption. When the stomach is distended with aliment, this reservoir undergoes a certain degree of compression, and the bile passes out into the intestinal canal; and in the efforts to vomit, the gall-bladder seems to be constantly affected, and at such times discharges itself of its contents.

Sometimes the bile concretes in the gall-bladder, so as to form what are called *gall-stones* (D). When these concretions pass into the cystic duct, they sometimes occasion exquisite pain, by distending the canal in their way to the duodenum; and by lodging in the ductus choledochus communis, and obstructing the course of the bile, this fluid will be absorbed, and by being carried back into the circulation occasion a temporary jaundice.

Sect. X. *Of the Spleen.*

99. The spleen is a soft and spongy viscus, of a bluish colour, and about five or six fingers breadth in length, and three in width, situated in the left hypochondrium, between the stomach and the false ribs. That side of it which is placed on the side of the ribs is convex; and the other, which is turned toward the stomach, is concave.

The splenic artery, which is a branch from the cæliac, supplies this viscus with blood, and a vein of the same name carries it back into the vena porta.

Its nerves are derived from a particular plexus called the *splenic*, which is formed by branches of the intercostal nerve, and by the eighth pair, or par vagum.

The ancients, who supposed two sorts of bile, considered the spleen as the receptacle of what they called *atra bilis*. Havers, who wrote professedly on the bones, determined its use to be that of secreting the synovia; and the late Mr Hewson imagined, that it concurred with the thymus and lymphatic glands of the body in forming the red globules of the blood. All these opinions seem to be equally fanciful. The want of an excretory duct has occasioned the real use of this viscus to be still doubtful. Perhaps the blood undergoes some change in it, which may assist in the preparation of the bile. This is the opinion of the generality of modern physiologists; and the great quantity of blood with which it is supplied, together with the course of its veins into the vena portæ, seem to render this notion probable.

Sect. XI. *Of the Glandulæ Renales, Kidneys, and Ureters.*

The glandulæ renales, which were by the ancients supposed to secrete the atra bilis, and by them named *capsulæ atrabilares*, are two flat bodies of an irregular figure, one on each side between the kidney and the aorta. 100.

In the fœtus they are as large as the kidneys: but they do not increase afterwards in proportion to those parts; and in adults and old people they are generally found shrivelled, and much wasted. They have their arteries and veins. Their arteries usually arise from the splenic or the emulgent, and sometimes from the aorta; and their veins go to the neighbouring veins, or to the vena cava. Their nerves are branches of the intercostal.

The use of these parts is not yet perfectly known. In the fœtus the secretion of urine must be in a very small quantity, and a part of the blood may perhaps then pass through these channels, which in the adult is carried to the kidneys to supply the matter of urine.

Kidneys.

The kidneys are two in number, situated one on the 101
right and the other on the left side in the lumbar region, between the last false rib and the os ilium, by the sides of the vertebræ. Each kidney in its figure resembles a sort of bean, which from its shape is called *kidney-bean*. The concave part of each kidney is turned towards the aorta and vena cava ascendens. They are surrounded by a good deal of fat, and receive a coat from the peritonæum; and when this is removed, a very fine membrane is found investing their substance and the vessels which ramify through them.

Each kidney has a considerable artery and vein, which are called the *emulgent*. The artery is a branch from the aorta, and the vein passes into the vena cava. Their nerves, which every where accompany the blood-vessels, arise from a considerable plexus, which is derived from the intercostal.

In each kidney, which in the adult is of a pretty firm texture, there are three substances to be distinguished (E). The outer part is glandular or cortical, beyond

(D) These concretions sometimes remain in the gall-bladder without causing any uneasiness. Dr Heberden relates, that a gall-stone weighing two drams was found in the gall-bladder of the late Lord Bath, though he had never complained of the jaundice, nor of any disorder which he could attribute to that cause. *Med. Transf.* Vol. ii.

(E) The kidneys in the fœtus are distinctly lobulated; but in the adult they become perfectly firm, smooth, and regular.

Of the Abdomen. beyond this is the vascular or tubular substance, and the inner part is papillary or membranous.

It is in the cortical part of the kidney that the secretion is carried on; the urine being here received from the minute extremities of the capillary arteries, is conveyed out of this cortical substance by an infinite number of very small cylindrical canals or excretory vessels, which constitute the tubular part. These tubes, as they approach the inner substance of the kidneys, gradually unite together; and thus forming larger canals, at length terminate in ten or twelve little protuberances called *papillæ*, the orifices of which may be seen without the assistance of glasses. These papillæ open into a small cavity or reservoir called the *pelvis of the kidney*, and formed by a distinct membranous bag which embraces the papillæ. From this pelvis the urine is conveyed through a membranous canal which passes out from the hollow side of the kidney, a

102 little below the blood vessels, and is called *ureter*.

Ureters. The ureters are each about as large as a common writing-pen. They are somewhat curved in their course from the kidneys, like the letter *f*, and at length terminate in the posterior and almost inferior part of the bladder, at some distance from each other. They pass into the bladder in the same manner as the ductus choledochus communis passes into the intestinum duodenum, not by a direct passage, but by an oblique course between the two coats; so that the discharge of urine into the bladder is promoted, whilst its return is prevented. Nor does this mode of structure prevent the passage of fluids only from the bladder into the ureters, but likewise air:—for air thrown into the bladder inflates it, and it continues to be distended if a ligature is passed round its neck; which seems to prove sufficiently that it cannot pass into the ureters.

Sect. XII *Of the Urinary Bladder.*

103. The urinary bladder is a membranous and muscular bag of an oblong roundish shape, situated in the pelvis, between the os pubis and intestinum rectum in men, and between the os pubis and uterus in women. Its upper and widest part is usually called the *bottom*, its narrow part the *neck* of the bladder; the former only is covered by the peritonæum.

The bladder is formed of three coats, connected together by means of cellular membrane. The external or peritonæal, is only a partial one, covering the upper and back part of the bladder. The middle, or muscular coat, is composed of irritable, and of course muscular fibres, which are most collected around the neck of the bladder, but not so as to form a distinct muscle, or sphincter, as the generality of anatomists have hitherto supposed.

The inner coat, though much smoother, has been said to resemble the villous tunic of the intestines, and like that is provided with a mucus which defends it against the acrimony of the urine.

104 Of the urine. It will be easily conceived from what has been said, that the kidneys are two glandular bodies, thro' which a saline and excrementitious fluid called *urine* is constantly filtering from the mass of blood.

While only a small quantity of urine is collected in the bladder, it excites no kind of uneasiness; but when a greater quantity is accumulated, so that the bladder is distended in a certain degree, it excites in us a certain sensation, which brings on as it were a voluntary contraction of the bladder to promote its discharge.—But this contraction is not effected by the muscular fibres of the bladder alone: for all the abdominal muscles contract in obedience to our will, and press downwards all the viscera of the lower belly; and these powers being united, at length overcome the resistance of the fibres surrounding the neck of the bladder, which dilates and affords a passage to the urine through the urethra.

The frequency of this evacuation depends on the quantity of urine secreted; on the degree of acrimony it possesses; on the size of the bladder, and on its degree of sensibility.

The urine varies much in its colour and contents. These varieties depend, on age, sex, climate, diet, and other circumstances. In infants it is generally a clean watery fluid, without smell or taste. As we advance in life, it acquires more colour and smell, and becomes more impregnated with salts. In old people it becomes still more acrid and fetid.

In a healthy state it is nearly of a straw colour.—After being kept for some time, it deposites a tartarous matter, which is found to be composed chiefly of earth and salt, and soon incrusts the sides of the vessel in which it is contained. While this separation is taking place, appearances like minute fibres or threads of a whitish colour may be seen in the middle of the urine, and an oily scum observed floating on its surface. So that the most common appearances of the urine are sufficient to ascertain that it is a watery substance, impregnated with earthy, saline, and oily particles.

The urine is not always voided of the same colour and consistence; for these are found to depend on the proportion of its watery part to that of its other constituent principles.—Its colour and degree of fluidity seem to depend on the quantity of saline and inflammable particles contained in it: so that an increased proportion of those parts will constantly give the urine a higher colour, and add to the quantity of sediment.

The variety in the appearance of the urine, depends on the nature and quantity of solid and fluid aliment we take in; and it is likewise occasioned by the different state of the urinary vessels, by which we mean the channels through which it is separated from the blood, and conveyed through the pelvis into the ureters. The causes of calculous concretions in the urinary passages, are to be looked for in the natural constitution of the body, mode of life, &c.

It having been observed, that after drinking any light wine or Spa water, it very soon passed off by urine, it has been supposed by some, that the urine is not altogether conveyed to the bladder by the ordinary course of circulation, but that there must certainly exist some other shorter means of communication, perhaps by certain vessels between the stomach and the bladder, or by a retrograde motion in the lymphatics. But it is certain, that if we open the belly of a dog, press out the urine from the bladder, pass a ligature round the emulgent arteries, and then sew up the abdomen, and give him even the most diuretic liquor to drink, the stomach and other channels will be distend-

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ed with it, but not a drop of urine will be found to have paſſed into the bladder; or the ſame thing happens when a ligature is thrown round the two ureters. This experiment then ſeems to be a ſufficient proof, that all the urine we evacuate, is conveyed to the kidneys through the emulgent arteries, in the manner we have deſcribed.—It is true, that wine and other liquors promote a ſpeedy evacuation of urine: but the diſcharge ſeems to be merely the effect of the ſtimulus they occaſion; by which the bladder and urinary parts are ſolicited to a more copious diſcharge of the urine, which was before in the body, and not immediately of that which was laſt drank; and this increaſed diſcharge, if the ſupply is kept up, will continue: nor will this appear wonderful, if we conſider the great capacity of the veſſels that go to the kidneys; the conſtant ſupply of freſh blood that is eſſential to health; and the rapidity with which it is inceſſantly circulated through the heart to all parts of the body.

Sect. XIII. *Of Digeſtion.*

105. We are now proceeding to ſpeak of *digeſtion*, which ſeems to be introduced in this place with propriety, after a deſcription of the abdominal viſcera, the greater part of which contribute to this function. By *digeſtion* is to be underſtood, the changes the aliment undergoes for the formation of chyle:—theſe changes are effected in the mouth, ſtomach, and ſmall inteſtines.

The mouth, of which every body has a general knowledge, is the cavity between the two jaws, formed anteriorly and laterally by the lips, teeth, and cheeks, and terminating poſteriorly in the throat.

The lips and cheeks are made up of fat and muſcles, covered by the cuticle, which is continued over the whole inner ſurface of the mouth, like a fine and delicate membrane.—Beſide this membrane, the inſide of the mouth is furniſhed with a ſpongy and very vaſcular ſubſtance called the *gums*, by means of which the teeth are ſecured in their ſockets. A ſimilar ſubſtance covers the roof of the mouth, and forms what is called the *velum pendulum palati*, which is fixed to the extremity of the arch formed by the oſſa maxillaria and oſſa palati, and terminates in a ſoft, ſmall, and conical body, named *uvula*; which appears, as it were, ſuſpended from the middle of the arch over the baſis of the tongue.

The velum pendulum palati performs the office of a valve between the cavity of the mouth and the pharynx, being moved by ſeveral muſcles (F).

The tongue is compoſed of ſeveral muſcles (G) which enable it to perform a variety of motions for the articulation of the voice; for the purpoſes of maſtication; and for conveying the aliment into the pharynx. Its upper part is covered with papillæ, which conſtitute the organ of taſte, and are eaſily to be diſtinguiſhed; it is covered by the ſame membrane that lines the inſide of the mouth, and which makes at its inferior part towards its baſis a reduplication called *frænum*.

Poſteriorly, under the velum palati, and at the baſis of the tongue, is the pharyx: which is the beginning of the œſophagus, ſtretched out every way, ſo as to reſemble the top of a funnel, through which the aliment paſſes into the ſtomach.

The mouth has a communication with the noſtrils at its poſterior and upper part; with the ears, by the Euſtachian tubes; with the lungs, by means of the larynx; and with the ſtomach, by means of the œſophagus.

The pharynx is conſtantly moiſtened by a fluid, ſecreted by two conſiderable glands called the *tonſils*, one on each ſide of the velum palati. Theſe glands, from their ſuppoſed reſemblance to almonds, have likewiſe been called *amygdalus*.

The mouth is moiſtened by a conſiderable quantity of ſaliva. This fluid is derived from the *parotid glands*; a name which by its etymology points out their ſituation to be near the ears. They are two in number, one on each ſide under the os malæ: and they are of the conglomerate kind; being formed of many ſmaller glands, each of which ſends out a very ſmall excretory duct, which unites with the reſt, to form one common channel, that runs over the cheek, and piercing the buccinator muſcle, opens into the mouth on each ſide, by an orifice into which a briſtle may be eaſily introduced.—Beſides theſe, the maxillary glands, which are placed near the inner ſurface of the angle of the lower jaw on each ſide; the ſublingual glands, which are ſituated at the root of the tongue; the glands of the palate, which are ſeated in the velum palati; and thoſe of the cheeks, lips, &c. together with many other leſs conſiderable ones,—pour the ſaliva into the mouth through their ſeveral excretory ducts.

The ſaliva, like all the other humours of the body, is found to be different in different people: but in general, it is a limpid and inſipid fluid, without ſmell in healthy ſubjects; and theſe properties would ſeem to prove that it contains very few ſaline or inflammable particles.

The uſes of the ſaliva ſeem to be to moiſten and lubricate the mouth, and to aſſiſt in reducing the aliment into a ſoft pulp before it is conveyed into the ſtomach.

106 Of hunger and thirſt.

The variety of functions which are conſtantly performed by the living body, muſt neceſſarily occaſion a continual waſte and diſſipation of its ſeveral parts. A great quantity is every day thrown off by the inſenſible perſpiration and other diſcharges; and were not theſe loſſes conſtantly recruited by a freſh ſupply of chyle, the body would ſoon effect its own diſſolution. But nature has very wiſely favoured us with organs fitted to produce ſuch a ſupply: and has at the ſame time endued us with the ſenſations of hunger and thirſt, that our attention may not be diverted from the neceſſary buſineſs of nutrition. The ſenſation of hunger is univerſally

(F) Theſe are the circumflexus palati, levator palati mollis, palato-pharyngæus conſtrictor iſthmi faucium and azygos uvulæ. See page 714.

(G) Theſe are, the genio-gloſſus, hyo-gloſſus, lingualis, and ſtylo-gloſſus. See page 714.

Of the Abdomen.

versally known; but it would perhaps be difficult to describe it perfectly in words. It may, however, be defined to be a certain uneasy sensation in the stomach, which induces us to wish for solid food; and which likewise serves to point out the proper quantity, and time for taking it. In describing the stomach, mention was made of the gastric juice, as every where lubricating its inner coat. This humour mixes itself with the aliment in the stomach, and helps to prepare it for its passage into the intestines; but when the stomach is perfectly empty, this same fluid irritates the coats of the stomach itself, and produces the sensation of hunger.

A certain proportion of liquid aliment is required to assist in the progress of digestion, and to afford that moisture to the body, of which there is such a constant dissipation.—Thirst induces us to take this necessary supply of drink; and the seat of this sensation is in the tongue, fauces, and œsophagus, which from their great sensibility are required to be kept moist: for though the fauces are naturally moistened by the mucus and salival juices; yet the blood, when deprived of its watery part or rendered acrimonious by any natural causes, never fails particularly to affect these parts, and the whole alimentary canal, and to occasion thirst.—This is the common effect of fevers and of hard labour, by both which too much of the watery part of the blood is dissipated.

107 Of mastication and deglutition.

It has been observed, that the aliment undergoes some preparation in the mouth before it passes into the stomach; and this preparation is the effect of mastication. In treating of the upper and lower jaws, mention was made of the number and arrangement of the teeth. The upper jaw was described as being immoveable; but the lower jaw was spoken of as being capable of elevation and depression, and of a grinding motion. The aliment, when first carried into the mouth, is pressed between the teeth of the two jaws by a very strong and frequent motion of the lower law; and the tongue and the cheeks assisting in this process, continue to replace the food between the teeth till it is perfectly divided, and reduced to the consistence of pulp. The incisores and canini divide it first into smaller pieces, but it is between the surfaces of the dentes molares by the grinding motion of the jaw that the mastication is completed.

During this process, the salival glands being gently compressed by the contraction of the muscles that move the lower jaw, pour out their saliva: this helps to divide and break down the food, which at length becomes a kind of pulp, and is then carried over the basis of the tongue into the fauces. But to effect this passage into the œsophagus, it is necessary that the other openings which were mentioned as having a communication with the mouth as well as the pharynx, should be closed; that none of the aliment, whether solid or liquid, may pass into them, whilst the pharynx alone is dilated to receive it:—And such a disposition actually takes place in a manner we will endeavour to describe.

The trachea arteria, or windpipe, through which the air is conveyed to the lungs, is placed before the œsophagus—in the act of swallowing; therefore, if the *larynx* (for so the upper part of the trachea is called) is not closed, the aliment will pass into it in its way to the œsophagus. But this is prevented by a small and very elastic cartilage, called *epiglottis*, which is attached only to the fore-part of the larynx; so that the food in its passage to the œsophagus presses down this cartilage, which then covers the glottis or opening of the larynx; and at the same time the velum palati being capable of some degree of motion, is drawn backwards by its muscles, and closes the openings into the nose and the Eustachian tubes.—This, however, is not all. The larynx, which being composed of cartilaginous rings, cannot fail in its ordinary state to compress the membranous canal of the œsophagus, is in the act of deglutition carried forwards and upwards by muscles destined for that purpose; and consequently drawing the fore-part of the pharynx with it, that opening is fully dilated. When the aliment has reached the pharyx, its descent is promoted by its own proper weight, and by the muscular fibres of the œsophagus, which continue to contract from above downwards, until the aliment has reached the stomach. That these fibres have no inconsiderable share in deglutition, any person may experience, by swallowing with his head downwards, when the descent of the aliment cannot possibly be effected by its weight.

It is necessary that the nostrils and the lungs should communicate with the mouth, for the purposes of speech and respiration: but if the most minute part of our food happens to be introduced into the trachea, it never fails to produce a violent cough, and sometimes the most alarming symptoms. This is liable to happen when we laugh or speak in the act of deglutition; the food is then said to have passed the wrong way. And indeed this is not improperly expressed: for death would soon follow, if the quantity of aliment introduced into the trachea should be sufficient to obstruct the respiration only during a very short time; or if the irritating particles of food should not soon be thrown up again by means of a cough, which in these cases very seasonably increases in proportion to the degree of irritation.

If the velum palati did not close the passage to the nostrils, deglutition would be performed with difficulty, and perhaps not at all; for the aliment would return through the nose, as is sometimes the case in drinking. Children, from a deficiency in this velum palati, have been seen to die a few hours after birth; and they who from disease or any other causes have not this part perfect, swallow with difficulty.

The aliment, after having been sufficiently divided by the action of the teeth, and attenuated by the saliva, is received into the stomach, where it is destined to undergo a more considerable change.

The properties of the aliment not being much altered at its first entrance into the stomach, and before it is thoroughly blended with the gastric juice, is capable of irritating the inner coat of the stomach to a certain degree, and occasions a contraction of its two orifices —In this membranous bag, surrounded by the abdominal viscera, and with a certain degree of natural heat, the aliment undergoes a constant agitation by means of the abdominal muscles and of the diaphragm, and likewile by a certain contraction or expansion of the muscular fibres of the stomach itself. By this motion, every part of the food is exposed to the action of the gastric juice, which gradually divides and attenuates it, and prepares it for its passage into the intestines.

Some

Of the Abdomen.

Some observations lately published by Mr Hunter in the Philosophical Transactions, tend to throw considerable light on the principles of digestion. There are few dead bodies in which the stomach, at its great end, is not found to be in some degree digested (H). Animals, or parts of animals, possessed of the living principle, when taken into the stomach, are not in the least affected by the action of that viscus; but the moment they lose the living principle, they become subject to its digestive powers. This seems to be the case with the stomach, which is enabled to resist the action of its juices in the living body: but when deprived of the living principle, it is then no longer able to resist the powers of that menstruum, which it had itself formed for the digestion of its contents; the process of digestion appearing to be continued after death. This is confirmed by what happens in the stomachs of fishes: They frequently swallow, without mastication, fish which are larger than the digesting parts of their stomach can contain; and in such cases, that part which is taken into the stomach is more or less dissolved, while that part which remains in the œsophagus is perfectly sound; and here, as well as in the human body, the digesting part of the stomach is often reduced to the same state as the digested part of the food. These appearences tend to prove, that digestion is not effected by a mechanical power, by contractions of the stomach, or by heat; but by a fluid secreted in the coats of the stomach, which is poured into its cavity, and there animalizes the food, or assimilates it to the nature of blood.

From some late experiments by M. Sage,* it appears, that inflammable air has the property of destroying and dissolving the animal texture: And as we swallow with the substances which serve us for food a great quantity of atmospherical air, M. Sage thinks it possible, that dephlogisticated, which is its principle, may be converted in the stomach into inflammable air, or may modify into inflammable air a portion of the oily substance which is the principle of aliments. In this case, would not the inflammable air (he asks), by dissolving our food, facilitate its coversion into chyle?

* *Hist. de l'Academie royal des Sciences &c. pour 1784. mem. 15.*

Be this as it may, the food, after having remained one, two, or three hours in the stomach, is converted into a greyish pulp, which is usually called *chymus*, a word of Greek etymology, signifying *juice*, and some few milky or chylous particles begin to appear.—But the term of its residence in this bag is proportioned to the nature of the aliment, and to the state of the stomach and its juices. The thinner and more perfectly digested parts of the food pass by a little at a time into the duodenum, through the pylorus, the fibres of which relax to afford it a passage; and the grosser and less digested particles remain in the stomach, till they acquire a sufficient fluidity to pass into the intestines, where the nature of the *chymus* is perfectly changed. The bile and pancreatic juice which flow into the duodenum, and the mucus, which is every where distilled from the surface of the intestines, mix themselves with the alimentary pulp, which they still farther attenuate and dissolve, and into which they seem to infuse new properties.

Two matters very different from each other in their nature and destination, are the result of this combination.—One of these, which is composed of the liquid parts of the aliment, and of some of its more solid particles, extremely divided and mixed with the juices we have described, constitutes a very mild, sweet, and whitish fluid, resembling milk, and distinguished by the name of *chyle*. This fluid is absorbed by the lacteal veins, which convey it into the circulation, where, by being assimilated into the nature of blood, it affords that supply of nutrition, which the continual waste of the body is found to require.—The other, is the remains of the alimentary mass deprived of all its nutritious particles, and containing only such parts as were rejected by the absorbing mouths of the lacteals. This grosser part, called the *fæces*, passes on through the course of the intestines, to be voided at the anus, as will be explained hereafter; for this process in the œconomy cannot be well understood till the motion of respiration has been explained. But the structure of the intestines is a subject which may be properly described in this place, and deserves to be attended to.

It has been already observed, that the intestinal canal is five or six times as long as the body, and that it forms many circumvolutions in the cavity of the abdomen, which it traverses from the right to the left, and again from the left to the right; in one place descending, and in another extending itself upwards. It was noticed likewise, that the inner coat of the intestines, by being more capacious than their exterior tunics, formed a multitude of plaits placed at a certain distance from each other, and called *valvulæ conniventes*. Now this disposition will be found to afford a farther proof of that divine wisdom, which the anatomist and physiologist cannot fail to discover in all their pursuits.—For if the intestinal canal was much shorter than it naturally is; if instead of the present circumvolutions it passed in a direct course from the stomach; and if its inner surface was smooth and destitute of valves; the aliment would consequently pass with great rapidity to the anus, and sufficient time would be wanting to assimilate the chyle, and for the necessary absorption of it into the lacteals: so that the body would be deprived of the supply of nutrition, which is so essential to life and health; but the length and circumvolutions of the intestines, the inequality of their internal surface,

(H) The Abbé Spallanzani, who has lately written upon digestion, finds, from a variety of experiments, made upon quadrupeds, birds, and fishes, that digestion goes on for some time after death, though far less considerable than in living animals; but heat is necessary in many animals, or at least promotes it in a much greater degree. He found also, that when the stomach was cut out of the body, it had somewhat of the power of digestion, though this was trifling when compared with that which took place when the stomach was left in the body. In not one of the animals was the great curvature of the stomach dissolved, or much eroded after death. There was often a little erosion, especially in different fishes; in which, when he had cleared the stomach of its contents, the internal coat was wanting. In other animals there was only a slight excoriation; and the injury

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face, and the course of the aliment through them, all concur to perfect the separation of the chyle from the fæces, and to afford the necessary nourishment to the body.

Sect. XIV. *Of the Course of the Chyle, and of the Lymphatic System.*

108. An infinite number of very minute vessels, called the *lacteal veins*, arise like net-work from the inner surface of the intestines, (but principally from the *jejunum* and *ilium),* which are destined to imbibe the nutritious fluid or chyle. These vessels, which were discovered by Asellius in 1622 (I), pass obliquely through the coats of the intestine, and running along the mesentery, unite as they advance, and form larger branches, all of which pass through the mesenteric or conglobate glands, which are very numerous in the human subject. As they run between the intestines and these glands, they are styled *venæ lacteæ primis generis:* but after leaving these glands, they are found to be less numerous, and being increased in size, are then called *venæ lacteæ secundi generis,* which go to deposite their contents in the *thoracic duct,* through which the chyle is conveyed into the blood.

This *thoracic duct* begins about the lower part of the first vertebra lumborum, from whence it passes up by the side of the aorta, between that and the vena azygos, close to the vertebræ, being covered by the pleura. Sometimes it is found divided into two branches; but they usually unite again into one canal, which opens into the left subclavian vein, after having run a little way in an oblique course between its coats. The subclavian vein communicates with the vena cava, which passes to the right auricle of the heart.

The lower part of this duct being usually larger than any other part of it, has been named *receptaculum chyli,* or *Pecquet's receptacle,* in honour of the anatomist who first discovered it in 1651. In some quadrupeds, in turtle and in fish, this enlargement * is more considerable in proportion to the size of the duct, than it usually is in the human subject, where it is not commonly found large enough to merit the name of *receptaculum.*

* Hewson's Exp. Inq. Part II.

Opportunities of observing the lacteals in the human subject do not often occur; but they may be easily demonstrated in a dog or any other quadruped that is killed two or three hours after feeding upon milk, for then they appear filled with white chyle.

But these *lacteals* which we have described, as passing from the intestines through the mesentery to the thoracic duct, compose only a part of a system of vessels which perform the office of *absorption,* and which constitute, with their common trunk the thoracic duct, and the conglobate glands that are dispersed through the body, what may be styled the *lymphatic system.* So that what is said of the structure of one of these series of vessels may very properly be applied to that of the other.

The *lymphatic veins* (K) are minute pellucid tubes, which, like the lacteals, direct their course towards the centre of the body, where they pour a colourless fluid into the thoracic duct. The lymphatics from all the lower parts of the body gradually unite as they approach this duct, into which they enter by three or four very large trunks, that seem to form the lower extremity of this canal, or *receptaculum chyli,* which may be considered as the great trunk of the lymphatic system. The lacteals open into it near the same place; and the lymphatics, from a large share of the upper parts of the body, pour their lymph into different parts of this duct as it runs upwards, to terminate in the left subclavian vein. The lymphatics from the right side of the neck, thorax, and right arm, &c. terminate in the right subclavian vein. 109 Lymphatic vessels.

As the lymphatics commonly lie close to the large blood-vessels, a ligature passed round the crural artery in a living animal, by including the lymphatics, will occasion a distension of these vessels below the ligature, so as to demonstrate them with ease; and a ligature passed round the thoracic duct, instantly after killing an animal, will, by stopping the course of its contents into

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jury in all of them was at the inferior part, or great curvature. The coats of the stomach suffer less after death than flesh, or part of the stomach of similar animals put into it: The author assigns as a reason for this, that these bodies are invested on all sides by the gastric fluid, whereas it only acts on the internal surface of the stomach.

(I) We are informed by Galen, that the lacteals had been seen in kids by Erasistratus, who considered them as arteries carrying a milky fluid: but from the remote time in which he lived, they do not seem to have been noticed till they were discovered in a living dog by Asellius, who denominated them *lacteals,* and considered them as serving to convey the chyle from the intestines to the liver; for before the discovery of the thoracic duct, the use of the liver was universally supposed to be that of converting the chyle into blood. But the discovery of the thoracic duct by Pecquet, not long after, corrected this error. Pecquet very candidly confesses, that this discovery accidentally arose from his observing a white fluid, mixed with the blood, flowing out of the vena cava, after he had cut off the heart of a living dog; which he suspected to be chyle, and afterwards traced to its source from the thoracic duct: This duct had been seen near an hundred years before in a horse by Eustachius, who speaks of it as a vein of a particular structure, but without knowing any thing of its termination or use.

(K) The arteries in their course through the body becoming gradually too minute to admit the red globules of the blood, have then been styled *capillary* or *lymphatic arteries.* The vessels which are here described as constituting the lymphatic system, were at first supposed to be continued from those arteries, and to convey back the lymph, either into the red veins or the thoracic duct; the office of absorption having been attributed to the *red veins.* But we know that the *lymphatic veins* are not continuations of the *lymphatic arteries,* but that they constitute the *absorbent system.* There are still, however, some very respectable names among the anatomists of the present age, who contend, that the red veins act likewise as absorbents:—but it seems to have been clearly proved, that the red veins do absorb no where but in the cavernous cells of the penis, the erection of which is occasioned by a distension of those cells with arterial blood.

into the ſubclavian vein, diſtend not only the lacteals, but alſo the lymphatics in the abdomen and lower extremities, with their natural fluids (L).

The coats of theſe veſſels are too thin to be ſeparated from each other; but the mercury they are capable of ſuſtaining, proves them to be very ſtrong; and their great power of contraction, after undergoing conſiderable diſtenſion, together with the irritability with which Baron Haller found them to be endued,* ſeems to render it probable, that, like the blood-veſſels, they have a muſcular coat.

* *Sur le movement du ſang.* Ex. 295, 298.

The lymphatics are nouriſhed after the ſame manner as all the other parts of the body. For even the moſt minute of theſe veſſels are probably ſupplied with ſtill more minute arteries and veins. This ſeems to be proved by the inflammation of which they are ſuſceptible; and the painful ſwellings which ſometimes take place in lymphatic veſſels, prove that they have nerves as well as blood-veſſels.

Both the lacteals, lymphatics, and thoracic duct, are furniſhed with valves, which are much more common in theſe veſſels than in the red veins. Theſe valves are uſually in pairs, and ſerve to promote the courſe of the chyle and lymph towards the thoracic duct, and to prevent its return. Mention has been made of the glands, through which the lacteals paſs in their courſe through the meſentery; and it is to be obſerved, that the lymphatics paſs through ſimilar glands in their way to the thoracic duct. Theſe glands are all of a conglobate kind, but the changes which the chyle and lymph undergo in their paſſage through them, have not yet been aſcertained.

The *lymphatic veſſels* begin from ſurfaces and cavities in all parts of the body as *abſorbents*. This is a fact now univerſally allowed; but how the fluids they abſorb are poured into thoſe cavities, is a ſubject of controverſy. The contents of the abdomen, for inſtance, were deſcribed as being conſtantly moiſtened by a very thin watery fluid. The ſame thing takes place in the pericardium, pleura, and all the other cavities of the body, and this watery fluid is the *lymph*. But whether it is exhaled into thoſe cavities through the minute ends of arteries, or tranſuded through their coats, are the points in diſpute. We cannot here be permitted to relate the many ingenious arguments that have been advanced in favour of each of theſe opinions; nor is it perhaps of conſequence to our preſent purpoſe to enter into the diſpute. It will be ſufficient if the reader can form an idea of what the lymph is, and of the manner in which it is abſorbed.

The *lymph*, from its tranſparency and want of colour, would ſeem to be nothing but water; and hence

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the firſt diſcoverers of theſe veſſels ſtiled them *ductus aquoſi*: but experiments prove, that the lymph of an healthy animal coagulates by being expoſed to the air, or a certain degree of heat, and likewiſe by being ſuffered to reſt; ſeeming to agree in this property with that part of the blood called the *coagulable lymph*.— This property of the lymph leads to determine its uſe, in moiſtening and lubricating the ſeveral cavities of the body in which it is found; and for which, by its gelatinous principle, it ſeems to be much better calculated than a pure and watery fluid would be, for ſuch it has been ſuppoſed to be by ſome anatomiſts.

The mouths of the *lymphatics* and *lacteals*, by acting as capillary tubes, ſeem to abſorb the *lymph* and *chyle* ſomewhat in the ſame manner as a capillary tube of glaſs, when put into a baſon of water, is enabled to attract the water into it to a certain height; but it is probable that they likewiſe poſſeſs a living power, which aſſiſts in performing this office. In the human body the *lymph*, or the *chyle*, is probably conveyed upon this principle as far as the firſt pair of valves, which ſeem to be placed not far from the orifice of the abſorbing veſſel, whether *lymphatic* or *lacteal*; and the fluid will then be propelled forwards, by a continuation of the abſorption at the orifice. But this does not ſeem to be the only inducement to its progreſs towards the thoracic duct; theſe veſſels have probably a muſcular coat, which may ſerve to preſs the fluid forwards from one pair of valves to another; and as the large lymphatic veſſels and the thoracic duct are placed cloſe to the large arteries, which have a conſiderable pulſation, it is reaſonable to ſuppoſe, that they derive ſome advantages from this ſituation.

Sect. XV. *Of the Generative Organs; of Conception, &c.*

§ 1. *The Male Organs.*

110. The male organs of generation have been uſually divided into the parts which ſerve to prepare the ſemen from the blood, and thoſe which are diſtended to convey it into the womb. But it ſeems to be more proper to diſtinguiſh them into the *preparing*, the *containing*, and the *expelling* parts, which are the different offices of the *teſtes*, the *veſiculæ ſeminales*, and the *penis*; and this is the order in which we propoſe to deſcribe them.

The teſtes are two glandular bodies, ſerving to ſecrete the ſemen from the blood. They are originally formed and lodged within the cavity of the abdomen; and it is not till after the child is born, or very near that time, that they begin to paſs into the groin, and from thence into the ſcrotum (M). By this diſpoſition they

(L) In the dead body they may be eaſily demonſtrated by opening the artery ramifying through any viſcus, as in the ſpleen, for inſtance, and then throwing in air; by which the lymphatics will be diſtended. One of them may then be punctured, and mercury introduced into it through a blow-pipe.

(M) It ſometimes happens in diſſecting ruptures, that the inteſtine is found in the ſame ſac, and in contact with the teſtis. This appearance was at firſt attributed to a ſuppoſed laceration of the peritonæum; but later obſervations, by pointing out the ſituation of the teſticles in the fœtus, have led to prove, that the teſtis, as it deſcends into the ſcrotum, carries with it a portion or elongation of the peritonæum, which becomes its tunica vaginalis, or a kind of ſac, in which the teſticle is lodged, as will be explained in the courſe of this ſection. The communication between this ſac and the cavity of the abdomen, is uſually ſoon cut off; but in ſome ſubjects they are very wisely protected from the injuries to which they would be liable to be exposed, from the different positions of the child at the time of parturition.

The testicles in this state are loosely attached to the psoæ muscles, by means of the peritonæum by which they are covered; and they are at this time of life connected in a very particular manner to the parietes of the abdomen, and likewise to the scrotum, by means of a substance which Mr Hunter calls the *ligament* or *gubernaculum testis*, because it connects the testis with the scrotum, and directs its course in its descent. This gubernaculum is of a pyramidal form, with its bulbous head fixed to the lower end of the testis and epididymis, and loses its lower and slender extremity in the cellular membrane of the scrotum. It is difficult to ascertain what the structure and composition of this gubernaculum is, but it is certainly vascular and fibrous; and, from certain circumstances, it would seem to be in part composed of the cremaster muscle, running upwards to join the lower end of the testis.

We are not to suppose that the testicle, when descended into the scrotum, is to be seen loose as a piece of gut or omentum would be in a common hernial sac. We have already observed, that during its residence in the cavity of the abdomen it is attached to the peritoneum, which descends with it; so that when the sac is completed in the scrotum, the testicle is at first attached only to the posterior part of it, while the fore part of it lies loose, and for some time affords a communication with the abdomen. The spermatic chord, which is made up of the spermatic artery and vein, and of the vas deferens or excretory duct of the testis, is closely attached behind to the posterior part of this elongation of the peritonæum. But the fore part of the peritoneal sac, which is at first loose and not attached to the testicle, closes after a certain time, and becomes united to the posterior part, and thus perfectly surrounds the testicle as it were in a purse.

The testicles of the fœtus differ only in their size and situation from those of the adult. In their passage from the abdomen they descend through the abdominal rings into the scrotum, where they are supported and defended by various integuments.

What the immediate cause of this descent is, has not yet been satisfactorily determined. It has been ascribed to the effect of respiration, but the testicles have sometimes been found in the scrotum before the child has breathed; and it does not seem to be occasioned by the action of the cremaster muscle, because the same effect would be liable to happen to the hedgehog, and some other quadrupeds, whose testicles remain in the abdomen during life.

The scrotum, which is the external or common covering of both testicles, is a kind of sac formed by the common integuments, and externally divided into two equal parts by a prominent line called *raphe*.

In the inner part of the scrotum we meet with a cellular coat called *dartos* (N), which by its duplicature divides the scrotum into two equal parts, and forms what is called *septum scroti*, which corresponds with the raphe. The collapsion which is so often observed to take place in the scrotum of the healthy subject, when excited by cold or by the stimulus of venery, seems to be very properly attributed to the contractile motion of the skin, and not to any muscular fibres, as is the case in dogs and some other quadrupeds.

The scrotum, then, by means of its septum, is found to make two distinct bags, in which the testicles, invested by their proper tunics, are securely lodged and separated from each other. These coats are the cremaster, the tunica vaginalis, and the tunica albuginea. The first of these is composed of muscular fibres, and is to be considered only as a partial covering of the testis; for it surrounds only the spermatic chord, and terminates upon the upper and external parts of the tunica vaginalis testis, serving to draw up and suspend the testicle (O). The tunica vaginalis testis has already been described as being a thin production of the peritonæum, loosely adhering every where to the testicle, which it includes as it were in a bag. The tunica albuginea is a firm, white, and very compact membrane of a glistening appearance, which immediately invests the body of the testis and the epididymus; serving in some measure to connect them to each other, but without extending itself at all to the spermatic chord. This tunica albuginea serves to confine the growth of the testis and epididymus within certain limits, and by giving them a due degree of firmness, enables them to perform their proper functions.

Having removed this last tunic, we discover the substance of the testicle itself, which appears to be made up of an infinite number of very elastic filaments, which may be best distinguished after macerating the testicle in water. Each testicle is made up of the spermatic artery and vein, and the excretory vessels or tubuli seminiferi. There are likewise a great number of absorbent vessels, and some branches of nerves to be met with in the testicles.

The spermatic arteries arise one on each side from the aorta, generally about an inch below the emulgents. The right spermatic vein commonly passes into the vena cava; but the left spermatic vein usually empties itself into the emulgent on that side; and it is supposed

jects it continues open during life; and when an hernia or descent of the intestine takes place in such a subject, it does not push down a portion of the peritonæum before it, as it must otherwise necessarily do, but passes at once through this opening, and comes in contact with the naked testicle, constituting that particular species of rupture called *hernia congenita*.

(N) The dartos has usually been considered as a muscle, and is described as such both by Douglas and Winslow. But there being no part of the scrotum of the human subject which can be said to consist of muscular fibres, Albinus and Haller have very properly omitted to describe the dartos as a muscle, and consider it merely as a cellular coat.

(O) The cremaster muscle is composed of a few fibres from the obliquus internus abdominis, which uniting with a few from the transversalis, descend upon the spermatic chord, and are insensibly lost upon the tunica vaginalis of the testicle. It serves to suspend and draw up the testicle.

Of the Abdomen.

posed to take this course into the emulgent, that it may avoid passing over the aorta, which it would be obliged to do in its way to the vena cava.

The blood is circulated very slowly through the spermatic artery, which makes an infinite number of circumvolutions in the substance of the testicle, where it deposites the semen, which passes through the tubuli seminiferi. These tubuli seminiferi are seen running in short waves from the tunica albuginea to the axis of the testicle; and are divided into distinct portions by certain thin membranous productions, which originate from the tunica albuginea. They at length unite, and by an infinite number of convolutions form a sort of appendix to the testis called *epididymis* (P), which is a vascular body of an oblong shape, situate upon the superior part of each testicle. These tubuli of the epididymis at length form an excretory duct called *vas deferens*, which ascends towards the abdominal rings, with the other parts that make up the spermatic chord, and then a separation takes place; the nerves and blood vessels passing on to their several terminations, and the vas deferens going to deposit its semen in the vesiculæ seminales, which are two soft bodies of a white and convoluted appearance externally, situated obliquely between the rectum and the lower part of the bladder, and uniting together at the lower extremity. From these reservoirs (Q), which are plentifully supplied with blood-vessels and nerves, the semen is occasionally discharged through two short passages, which open into the urethra close to a little eminence called *verumontanum*.

Near this eminence we meet with the prostate, which is situated at the neck of the bladder, and is described as being of a glandular structure. It is shaped somewhat like a heart with its small end foremost, and invests the origin of the urethra. Internally it appears to be of a firm substance, and composed of several follicles, secreting a whitish viscid fluid, that is discharged by ten or twelve excretory ducts into the urethra, on each side of the openings of the vesiculæ seminales at the same time, and from the same causes that the semen is expelled. As this latter fluid is found to be exceedingly limpid in the vesiculæ seminales of the dead subject, it probably owes its whiteness and viscidity to this liquor of the prostate.

The penis, which is to be considered as the vehicle or active organ of procreation, is composed of two columns, the corpora cavernosa, and corpus spongiosum. The corpora cavernosa, which constitute the greatest part of the penis, may be described as two cylindrical ligamentous tubes, each of which is composed of an infinite number of minute cells of a spongy texture, which communicate with each other. These two bodies are of a very pliant texture, and capable of considerable distention; and being united laterally to each other, occasion by this union a space above and another below. The uppermost of these spaces is filled by the blood vessels, and the lower one, which is larger than the other, by the urethra and its corpus spongiosum. These two cavernous bodies are at first only separated by a partition of tendinous fibres, which allow them to communicate with each other; but they afterwards devaricate from each other like the branches of the letter Y, and diminishing gradually in size, are attached,

(P) The testicles were named *didymi* by the ancients, and the name of this part was given to it on account of its situation upon the testicle.

(Q) That the bags called *vesiculæ seminales* are reservoirs of semen, is a circumstance which has been by anatomists universally believed. Mr J. Hunter, however, from several circumstances, has been induced to think this opinion erroneous.

He has examined these vesiculæ in people who have died suddenly, and he found their contents to be different in their properties from the semen. In those who had lost one of the testicles, or the use of one of them, by disease, both the vesiculæ were full, and their contents similar. And in a *lusus naturæ*, where there was no communication between the vasa deferentia and vesiculæ, nor between the vesiculæ and penis, the same thing took place.

From these observations, he thinks we have a presumptive proof, That the semen can be absorbed in the body of the testicle and in the epididymis, and that the vesiculæ secrete a mucus which they are capable of absorbing when it cannot be made use of: That the semen is not retained in reservoirs after it is secreted, and kept there till it is used; but that it is secreted at the time, in consequence of certain affections of the mind stimulating the testicles to this action.

He corroborates his observations by the appearance on dissection in other animals; and here he finds, That the shape and contents of the vesiculæ vary much in different animals, while the semen in most of them he has examined is nearly the same: That the vasa deferentia in many animals do not communicate with the vesiculæ: That the contents of the vesiculæ of castrated and perfect animals are similar, and nearly equal in quantity, in no way resembling the semen as emitted from the animal *in coitu*, or what is found in the vas deferens after death. He observes likewise, that the bulb of the urethra of perfect males is considerably larger than in castrated animals.

From the whole, he thinks the following inferences may be fairly drawn: That the bags called *vesiculæ seminales* are not seminal reservoirs, but glands secreting a peculiar mucus; and that the bulb of the urethra is properly speaking the receptacle of the semen, in which it is accumulated previous to ejection.

But although he has endeavoured to prove that the vesiculæ do not contain the semen, he has not been able to ascertain their particular use. He thinks, however, we may be allowed upon the whole to conclude, that they are, together with other parts, subservient to the purposes of generation.

Although the author has treated this subject very ably, and made many ingenious observations, some things may be objected to what he had advanced; of which the following are a few: That those animals who have which tached, one on each ſide, by means of the ligamentum ſuſpenſorium penis to the ramus iſchii, and to the inferior portion of the os pubis.

The corpus ſpongioſum penis, or corpus ſpongioſum urethræ, as it is ſtyled by ſome authors, begins as ſoon as the urethra has paſſed the proſtate, with a thick origin almoſt like a heart, firſt under the urethra, and afterwards above it, becoming gradually thinner, and ſurrounding the whole canal of the urethra, till it terminates in a conſiderable expanſion, and conſtitutes what is called the *glans penis*, which is exceedingly vaſcular, and covered with papillæ like the tongue. The cuticle which lines the inner ſurface of the urethra, is continued over the glans in the ſame manner as it is ſpread over the lips.

The penis is inveſted by the common integuments, but the cutis is reflected back every where from the glans as it is in the eye-lids; ſo that it covers this part, when the penis is in a relaxed ſtate, as it were with a hood, and from this uſe is called *prepuce*.

The prepuce is tied down to the under part of the glans by a ſmall ligament called *frænum*, which is in fact only a continuation of the cuticle and cutis. There are many ſimple ſebaceous follicles called *glandulæ odoriferæ*, placed round the baſis of the glans; and the fluid they ſecrete ſerves to preſerve the exquiſite ſenſibility of this part of the penis, and to prevent the ill effects of attrition from the prepuce.

The urethra may be defined to be a membranous canal, paſſing from the bladder through the whole extent of the penis. Several very ſmall openings, called *lacunæ*, communicate with this canal, through which a mucus is diſcharged into it; and beſides theſe, there are two glands, firſt deſcribed by Cowper, as ſecreting a fluid for lubricating the urethra, and called *Cowper's glands* (R); and Littre* ſpeaks of a gland ſituated near the proſtate, as being deſtined for the ſame uſe.

* *Memoires de l'Acad. Royale des Sciences, 1700.*

The urethra being continued from the neck of the bladder, is to be conſidered as making part of the urinary paſſage; and it likewiſe affords a conveyance to the ſemen, which we have obſerved is occaſionally diſcharged into it from the veſiculæ ſeminales. The direction of this canal being firſt under and then before the pubis, occaſions a winding in its courſe from the bladder to the penis not unlike the turns of the letter *S*.

The penis has three pair of muſcles, the erectores, acceleratores, and tranſverſales. They puſh the blood from the crura to the fore part of the corpora cavernoſa. The firſt originate from the tuberoſity of the iſchium, and terminate in the corpora cavernoſa. The acceleratores ariſe from the ſphincter, and by their inſertion ſerve to compreſs the bulbous part of the urethra; and the tranſverſales are deſtined to afford a paſſage to the ſemen, by dilating the canal of the urethra.

The arteries of the penis are chiefly derived from the internal iliacs. Some of them are ſuppoſed to terminate by pabulous orifices within the corpora cavernoſa and corpus ſpongioſum; and others terminate in veins, which at laſt make up the vena magna dorſi penis, and other ſmaller veins, which are in general diſtributed in like order with the arteries.

Its nerves are large and numerous. They ariſe from the great ſciatic nerve, and accompany the arteries in their courſe through the penis.

We have now deſcribed the anatomy of this organ; and there only remains to be explained, how it is enabled to attain that degree of firmneſs and diſtenſion which is eſſential to the great work of generation.

The greateſt part of the penis has been ſpoken of as being of a ſpongy and cellular texture, plentifully ſupplied with blood-veſſels and nerves, and as having muſcles to move it in different directions. Now, the blood is conſtantly paſſing into its cells through the ſmall branches of the arteries which open into them, and is from thence as conſtantly returned by the veins, ſo long as the corpora cavernoſa and corpus ſpongioſum continue to be in a relaxed and pliant ſtate. But when, from any nervous influence, or other means, which it is not neceſſary here to define or explain, the erectores penis, ejaculatores ſeminis, levatores ani, &c. are induced to contract, the veins undergo a certain degree of compreſſion, and the paſſage of the blood through them is ſo much impeded, that it collects in them in a greater proportion than they are enabled to carry off, ſo that the penis gradually enlarges; and being more and more forcibly drawn up againſt the os pubis, the vena magna itſelf is at length compreſſed, and the penis becomes fully diſtended. But as the cauſes which firſt occaſioned this diſtention ſubſide, the penis gradually returns to its ſtate of relaxation.

§ 2. *Female Organs of Generation.*

III. ANATOMICAL writers uſually divide the female organs of generation into *external* and *internal*. In the firſt diviſion they include the *mons veneris*, *labia pudendi*, *perinæum*, *clitoris*, *nymphæ*, and *carunculæ myrtiformes*; and in the latter, the *vagina* with the *uterus* and its appendages.

bags called *veſiculæ ſeminales* perform copulation quickly; whereas others that want them, as in the dog kind, are tedious in copulation: That in the human body, at leaſt, there is a free communication between the vaſa deferentia and veſiculæ; and in animals where the author has obſerved no communication between the vaſa deferentia and veſiculæ, there may be a communication by veſſels not yet diſcovered, and which may be compared to the hepato-cyſtic ducts in fowls and fiſhes: That the fluid in the end of the vaſa deferentia and the veſiculæ ſeminales are ſimilar, according to the author's own obſervation: That the veſiculæ in ſome animals increaſe and decreaſe with the teſticle at particular ſeaſons: That in birds and certain fiſhes, there is a dilatation of the ends of the vaſa deferentia, which the author himſelf allows to be a reſervoir for the ſemen.

With reſpect to the circumſtance of the bulb of the urethra anſwering the purpoſe of a reſervoir, the author has mentioned no facts which tend to eſtabliſh this opinion. *See obſervations on certain Parts of the Animal Oeconomy.*

(R) Both Heiſter and Morgagni obſerve, that they have ſometimes not been able to find theſe glands; ſo that they do not ſeem to exiſt in all ſubjects.

Of the Abdomen.

The *mons veneris*, which is placed on the upper part of the ſymphyſis pubis, is internally compoſed of adipoſe membranes, which makes it ſoft and prominent: it divides into two parts called *labia pudendi*, which deſcending towards the rectum, from which they are divided by the perinæum, form what is called the *fourchette*. The perinæum is that fleſhy ſpace which extends about an inch and an half from the fourchette to the anus, and from thence about two inches to the coccyx.

The labia pudendi being ſeparated, we obſerve a ſulcus called *foſſa magna;* in the upper part of which is placed the clitoris, a ſmall round ſpongy body, in ſome meaſure reſembling the male penis, but impervious, compoſed of two corpora cavernoſa, ariſing from the tuberoſities of the oſſa iſchii; furniſhed with two pair of muſcles, the erectores clitoridis, and the ſphincter or conſtrictor oſtii vaginæ; and terminating in a glans, which is covered with its prepuce. From the lower part, on each ſide of the foſſa, paſs the nymphæ, two membranous and ſpongy folds which ſeem deſtined for uſeful purpoſes in parturition, by tending to enlarge the volume of the vagina as the child's head paſſes through it. Between theſe, about the middle of the foſſa magna, we perceive the orifice of the vagina or os externum, cloſed by folds and wrinkles; and about half an inch above this, and about an inch below the clitoris, appears the meatus urinarius or orifice of the urethra, much ſhorter, though ſomewhat larger, than in men, with a little prominence at its lower edge, which facilitates the introduction of the catheter.

The os externum is ſurrounded internally by ſeveral membranous folds called *carunculæ myrtiformes*, which are partly the remains of a thin membrane called *hymen*, that covers the vagina in children. In general the hymen is ſufficiently open to admit the paſſage of the menſes, if it exiſts at the time of their appearance; ſometimes, however, it has been found perfectly cloſed.

The vagina, ſituated between the urethra and the rectum, is a membranous cavity, ſurrounded eſpecially at its external extremity with a ſpongy and vaſcular ſubſtance, which is covered by the ſphinctor oſtii vaginæ. It terminates in the uterus, about half an inch above the os tincæ, and is wider and ſhorter in women who have had children than in virgins.

All theſe parts are plentifully ſupplied with blood-veſſels and nerves. Around the nymphæ there are ſebaceous follicles, which pour out a fluid to lubricate the inner ſurface of the vagina; and the meatus urinarius, like the urethra in the male ſubject, is conſtantly moiſtened by a mucus, which defends it againſt the acrimony of the urine.

The *uterus* is a hollow viſcus, ſituated in the hypograſtric region, between the rectum and bladder. It is deſtined to receive the firſt rudiments of the fœtus, and to aſſiſt in the developement of all its parts, till it arrives at a ſtate of perfection, and is fitted to enter into the world, at the time appointed by the wiſe Author of nature.

The uterus, in its unimpregnated ſtate, reſembles a pear in ſhape, ſomewhat flattened, with its fundus or bottom part turned towards the abdomen, and its cervix or neck ſurrounded by the vagina. The entrance into its cavity forms a little protuberance, which has been compared to the mouth of a tench, and is therefore called *os tincæ*.

The ſubſtance of the uterus, which is of a conſiderable thickneſs, appears to be compoſed of muſcular and ſmall ligamentous fibres, ſmall branches of nerves, ſome lymphatics, and with arteries and veins innumerable. Its nerves are chiefly derived from the intercoſtal, and its arteries and veins from the hypogaſtric and ſpermatic. The membrane which lines its cervix, is a continuation of the inner membrane of the vagina; but the outer ſurface of the body of the uterus is covered with the peritonæum, which is reflected over it, and deſcends from thence to the inteſtinum rectum. This duplicature of the peritonæum, by paſſing off from the ſides of the uterus to the ſides of the pelvis, is there firmly connected, and forms what are called *ligamenta uteri lata;* which not only ſerve to ſupport the uterus, but to convey nerves and blood-veſſels to it.

The *ligamenta uteri rotunda* ariſe from the ſides of the fundus uteri, and paſſing along within the fore-part of the ligamenta lata, deſcend through the abdominal rings, and terminate in the ſubſtance of the mons veneris. The ſubſtance of theſe ligaments is vaſcular, and although both they and the ligamenta lata admit the uterus in the virgin ſtate, to move only about an inch up and down, yet in the courſe of pregnancy they admit of conſiderable diſtenſion, and after parturition return nearly to their original ſtate with ſurpriſing quickneſs.

On each ſide of the inner ſurface of the uterus, in the angle near the fundus, a ſmall orifice is to be diſcovered, which is the beginning of one of the tubæ fallopianæ. Each of theſe tubes, which are two in number, paſſing through the ſubſtance of the uterus, is extended along the broad ligaments, till it reaches the edge of the pelvis, from whence it reflects back; and turning over behind the ligaments, about an inch of its extremity is ſeen hanging looſe in the pelvis, near the ovarium. Theſe extremities, having a jagged appearance, are called *fimbriæ*, or *morſus diaboli*. Each tuba Fallopiana is uſually about three or four inches long. Their cavities are at firſt very ſmall, but become gradually larger, like a trumpet, as they approach the fimbriæ.

Near the fimbriæ of each tuba Fallopiana, about an inch from the uterus, is ſituated an oval body called *ovarium*, of about half the ſize of the male teſticle. Each of theſe ovaria is covered by a production of the peritonæum, and hangs looſe in the pelvis. They are of a flat and angular form, and appear to be compoſed of a white and cellular ſubſtance, in which we are able to diſcover ſeveral minute veſicles filled with a coagulable lymph, of an uncertain number, commonly exceeding 12 in each ovary. In the female of riper years, theſe veſicles become exceedingly turgid, and a kind of yellow coagulum is gradually formed within one of them, which increaſes for a certain time. In conception, one of theſe mature ova is ſuppoſed to be impregnated with the male ſemen, and to be ſqueezed out of its nidus into the Fallopian tube; after which the ruptured part forms a ſubſtance which in ſome animals is of a yellow colour, and is therefore called *corpus luteum*; and it is obſerveable, that the number of theſe ſcars or fiſſures in the ovarium, conſtantly correſponds with the number of fœtuſes excluded by the mother.

MAN

Of the Abdomen.

§ 3. *Of Conception.*

112. MAN, being ever curious and inquisitive, has naturally been led to enquire after the origin of his existence; and the subject of generation has employed the philosophical world in all ages: but in following nature up to her minute recesses, the philosopher soon finds himself bewildered, and his imagination often supplies that which he so eagerly wishes to discover, but which is destined perhaps never to be revealed to him. Of the many theories which have been formed on this subject, that of the ancient philosophers seems to have been the most simple: they considered the male semen as alone capable of forming the fœtus, and believed that the female only afforded it a lodging in the womb, and supplied it with nourishment after it was perfectly formed. This opinion, however, soon gave place to another, in which the female was allowed a more considerable share in conception.

This second system considered the fœtus as being formed by the mixture of the seminal liquor of both sexes, by a certain arrangement of its several particles in the uterus. But in the 16th century, vesicles or eggs were discovered in the ovaria or female testicles; the fœtus had been found sometimes in the abdomen, and sometimes in the Fallopian tubes; and the two former opinions were exploded in favour of a new doctrine. The ovaria were compared to a bunch of grapes, being supposed to consist of vesicles, each of which had a stalk; so that it might be disengaged without hurting the rest, or spilling the liquor it contained. Each vesicle was said to include a little animal, almost complete in all its parts; and the vapour of the male semen being conveyed to the ovarium, was supposed to produce a fermentation in the vesicle, which approached the nearest to maturity; and thus inducing it to disengage itself from the ovarium, it passed into the tuba Fallopiana, thro' which it was conveyed to the uterus. Here it was supposed to take root like a vegetable seed, and to form, with the vessels originating from the uterus, what is called the *placenta;* by means of which the circulatiom is carried on between the mother and the fœtus.

This opinion, with all its absurdities, continued to be almost universally adopted till the close of the same century, when Liewenhoeck, by means of his glasses discovered certain opake particles, which he described as so many animalcula, floating in the seminal fluid of the male.

This discovery introduced a new schism among the philosophers of that time, and gave rise to a system which is not yet entirely exploded. According to this theory the male semen passing into the tubæ Fallopianæ, one of the animalcula penetrates into the substance of the ovarium, and enters into one of its vesicles or ova. This impregnated ovum is then squeezed from its husk, through the coats of the ovarium, and being seized by the fimbriæ, is conducted through the tube to the uterus, where it is nourished till it arrives at a state of perfection. In this system there is much ingenuity; but there are certain circumstances supposed to take place, which have been hitherto inexplicable. A celebrated modern writer, M. Buffon, endeavours to restore, in some measure, the most ancient opinion, by allowing the female semen a share in this office; asserting, that animalcula or organic particles are to be discovered in the seminal liquor of both sexes: he derives the female semen from the ovaria, and he contends that no ovum exists in those parts. But in this idea he is evidently mistaken; and the opinion now most generally adopted is, that an impregnation of the ovum, by the influence of the male semen, is essential to conception (s). That the ovum is to be impregnated, there can be no doubt; but as the manner in which such an impregnation is supposed to take place, and the means by which the ovum afterwards gets into the Fallopian tube, and from thence into the uterus, are still founded chiefly on hypothesis, we will not attempt to extend farther the investigation of a subject concerning which so little can be advanced with certainty.

§ 4. *Of the Fœtus in Utero.*

OPPORTUNITIES of dissecting the human gravid uterus occurring but seldom, the state of the embryo (T) immediately after conception cannot be perfectly known. 113.

When the ovum descends into the uterus, it is supposed to be very minute; and it is not till a considerable time after conception that the rudiments of the embryo begin to be ascertained.

About the third or fourth week the eye may discover the first lineaments of the fœtus; but these lineaments are as yet very imperfect, it being only about the size of a house-fly. Two little vesicles appear in an almost transparent jelly; the largest of which is destined to become the head of the fœtus, and the other smaller one is reserved for the trunk. But at this period no extremities are to be seen; the umbilical cord appears only as a very minute thread, and the placenta does not as yet absorb the red particles of the blood. At six weeks, not only the head but the features of the face begin to be developed. The nose appears like a small prominent line, and we are able to discover another line under it, which is destined for the separation of the lips. Two black points appear in the place of eyes, and two minute holes mark the ears. At the sides of the trunk, both above and below, we see four minute protuberances, which are the rudiments of the arms and legs. At the end of eight weeks the body of the fœtus is upwards of an inch in length, and both the hands and feet are to be distinguished. The upper extremities are found to increase faster than the lower ones, and the separation of the fingers is accomplished sooner than that of the toes.

At this period the human form may be decisively ascertained; all the parts of the face may be distinguished

(s) The learned Abbè Spallanzani has thrown much light on this curious subject, and has proved by a variety of experiments that the animalcule exists entire in the female ovum, and that the male seed is only necessary to vivify and put it in motion. His experiments and observations are worthy the attentive perusal of every physiologist.

(T) The rudiments of the child are usually distinguished by this name till the human figure can be distinctly ascertained, and then it has the appellation of *fœtus*.

Of the Abdomen.

guished, the shape of the body is clearly marked out, the haunches and the abdomen are elevated, the fingers and toes are separated from each other, and the intestines appear like minute threads.

At the end of the third month, the fœtus measures about three inches; at the end of the fourth month, five inches; in the fifth month, six or seven inches; in the sixth month, eight or nine inches; in the seventh month, eleven or twelve inches; in the eighth month, fourteen or fifteen inches; and at the end of the ninth month, or full time, from eighteen to twenty-two inches. But as we have not an opportunity of examining the same fœtus at different periods of pregnancy, and as their size and length may be influenced by the constitution and mode of life of the mother, calculations of this kind must be very uncertain.

The fœtus during all this time assumes an oval figure, which corresponds with the shape of the uterus. Its chin is found reclining on its breast with its knees drawn up towards its chin, and its arms folded over them. But it seems likely, that the posture of some of these parts is varied in the latter months of pregnancy, so as to cause those painful twitches which its mother usually feels from time to time. In natural cases, its head is probably placed towards the os tincæ from the time of conception to that of its birth; though formerly it was considered as being placed towards the fundis uteri till about the eighth or ninth month, when the head, by becoming specifically heavier than the other parts of the body, was supposed to be turned downwards.

The capacity of the uterus increases in proportion to the growth of the fœtus, but without becoming thinner in its substance, as might naturally be expected. The nourishment of the fœtus, during all this time, seems to be derived from the placenta, which appears to be originally formed by that part of the ovum which is next the fundus uteri. The remaining part of the ovum is covered by a membrane called *spongy chorion* (u); within which is another called *true chorion*, which includes a third termed *amnios* (v): this contains a watery fluid, which is the *liquor amnii* (w), in which the fœtus floats till the time of its birth. On the side next the fœtus, the placenta is covered by the amnios and true chorion; on the side next the mother it has a production continued from the spongy chorion. The amnios and chorion are remarkably thin and transparent, having no blood-vessels entering into their composition. The spongy chorion is opake and vascular.

Of the Abdomen.

In the first months of pregnancy, the involucra bear a large proportion to their contents; but this proportion is afterwards reversed, as the fœtus increases in bulk.

The placenta, which is the medium through which the blood is conveyed from the mother to the fœtus, and the manner in which this conveyance takes place, deserve next to be considered.

The placenta is a broad, flat, and spongy substance, like a cake, closely adhering to the inner surface of the womb, usually near the fundus, and appearing to be chiefly made up of the ramifications of the umbilical arteries and vein, and partly of the extremities of the uterine vessels. The arteries of the uterus discharge their contents into the substance of this cake; and the veins of the placenta, receiving the blood either by a direct communication of vessels, or by absorption, at length form the umbilical vein, which passes on to the sinus of the vena porta, and from thence to the vena cava, by means of the canalis venosus, a communication that is closed in the adult. But the circulation of the blood through the heart is not conducted in the fœtus as in the adult: in the latter, the blood is carried from the right auricle of the heart through the pulmonary artery, and is returned to the left auricle by the pulmonary vein; but a dilatation of the lungs is essential to the passage of the blood through the pulmonary vessels, and this dilatation cannot take place till after the child is born and has respired. This deficiency, however, is supplied in the fœtus by the immediate communication between the right and left auricle, through an oval opening, in the septum which divides the two auricles, called *foramen ovale*. The blood is likewise transmitted from the pulmonary artery to the aorta, by means of a duct called *canalis arteriosus*, which, like the canalis venosus, and foramen ovalæ, gradually closes after birth.

The blood is returned again from the fœtus through two arteries called the *umbilical arteries*, which arise from the iliacs. These two vessels taking a winding course with the vein, form with that, and the membranes by which they are surrounded, what is called the *umbilical chord*. These arteries, after ramifying through the substance of the placenta, discharge their blood into the veins of the uterus; in the same manner as the uterine arteries discharged their blood into the branches

(u) Dr Hunter has described this as a lamella from the inner surface of the uterus. In the latter months of pregnancy it becomes gradually thinner and more connected with the chorion: he has named it *membrana caduca*, or *decidua*, as it is cast off with the placenta. Signior Scarpa, with more probability, considers it as being composed of an inspissated coagulable lymph.

(v) In some quadrupeds, the urine appears to be conveyed from the bladder through a canal called *urachus*, to the *allantois*, which is a reservoir, resembling a long and blind gut, situated between the chorion and amnios. The human fœtus seems to have no such reservoir, though some writers have supposed that it does exist. From the top of the bladder a few longitudinal fibres are extended to the umbilical chord; and these fibres have been considered as the urachus, though without having been ever found pervious.

(w) The liquor amnii coagulates like the lymph. It has been supposed to pass into the œsophagus, and to afford nourishment to the fœtus; but this does not seem probable. Children have come into the world without an oesophagus, or any communication between the stomach and the mouth; but there has been no well attested instance of a child's having been born without a placenta; and it dees not seem likely, that any of the fluid can be absorbed through the pores of the skin, the skin in the foetus being every where covered with a great quantity of mucus.

 branches of the umbilical vein. So that the blood is constantly passing in at one side of the placenta and out at the other; but in what particular manner it gets through the placenta is a point not yet determined.

EXPLANATION OF PLATES XXV. XXVI. AND XXVII.

PLATE XXV.

FIG. 1. Shows the Contents of the Thorax and Abdomen in situ.

1. Top of the trachea, or wind-pipe. 2 2, The internal jugular veins. 33, The subclavian veins. 4, The vena cava descendens. 5, The right auricle of the heart. 6, The right ventricle. 7, Part of the left ventricle. 8, The aorta descendens. 9, The pulmonary artery. 10, The right lung, part of which is cut off to show the great blood vessels. 11, The left lung entire. 12 12, The anterior edge of the diaphragm. 13 13, The two great lobes of the liver. 14, The ligamentum rotundum. 15, The gall-bladder. 16, The stomach. 17 17, The jejunum and ilium. 18, The spleen.

FIG. 2. Shows the Organs subservient to the Chylopoietic Viscera,—with those of Urine and Generation.

1 1, The under side of the two great lobes of the liver. a, Lobulus Spigelii. 2, The ligamentum rotundum. 3, The gall-bladder. 4. The pancreas. 5, The spleen. 6 6, The kidneys. 7, The aorta descendens. 8, Vena cava ascendens. 9 9, The renal veins covering the arteries. 10, A probe under the spermatic vessels and a bit of the inferior mesenteric artery, and over the ureters. 11 11, The ureters. 12 12, The iliac arteries and veins. 13, The rectum intestinum. 14, The bladder of urine.

FIG. 3. Shows the Chylopoietic Viscera, and Organs subservient to them, taken out of the Body entire.

A A, The under side of the two great lobes of the liver. B, Ligamentum rotundum. C, The gall-bladder. D, Ductus cysticus. E, Ductus hepaticus. F, Ductus communis choledochus. G, Vena portarum. H, Arteria hepatica. I I, The stomach. K K, Venæ & arteriæ gastro-epiploicæ, dextræ & sinistræ. L L, Venæ & arteriæ coronariæ ventriculi. M, The spleen. N N, Mesocolon, with its vessels. O O O, Intestinum colon. P, One of the ligaments of the colon, which is a bundle of longitudinal muscular fibres. Q Q Q Q, Jejunum and ilium. R R, Sigmoid flexure of the colon with the ligament continued, and over S, The rectum intestinum. T T, Levators ani. U, Sphincter ani. V, The place to which the prostate gland is connected. W, The anus.

FIG. 4. Shows the Heart of a Fœtus at the full time, with the Right Auricle cut open to show the Foramen Ovale, or passage between both Auricles.

a, The right ventricle. b, The left ventricle. c c, The outer side of the right auricle stretched out. d d, The posterior side, which forms the anterior side of the septum. e, The foramen ovale, with the membrane or valve which covers the left side. f, Vena cava inferior passing through g, A portion of the diaphragm.

FIG. 5. Shows the Heart and Large Vessels of a Fœtus at the full time.

a, The left ventricle. b, The right ventricle. c, A part of the right auricle. d, Left auricle. e e, The right branch of the pulmonary artery. f, Arteria pulmonalis. g g, The left branch of the pulmonary artery, with a number of its largest branches dissected from the lungs. h, The canalis arteriosus. i, The arch of the aorta. k k, The aorta descendens. l, The left subclavian artery. m, The left cartoid artery. n, The right carotid artery. o, The right subclavian artery. p, The origin of the right carotid and right subclavian arteries in one common trunk. q, The vena cava superior or descendens. r, The right common subclavian vein. s, The left common subclavian vein.

N. B. All the parts described in this figure are to be found in the adult, except the canalis arteriosus.

PLATE XXVI.

FIG. 1. Exhibits the more superficial Lymphatic Vessels of the Lower Extremity.

A, The spine of the os ilium. B, The os pubis. C, The iliac artery. D, The knee. E, E, F, Branches of the crural artery. G, The musculus gastrocnemius. H, The tibia. I, The tendon of the musculus tibialis anticus. On the outlines, a, A lymphatic vessel belonging to the top of the foot. b, Its first division into branches. c, c, c, Other divisions of the same lymphatic vessel. d, A small lymphatic gland. e, The lymphatic vessels which lie between the skin and the muscles of the thigh. f f, Two lymphatic glands at the the upper part of the thigh below the groin. g g, Other glands. h, A lymphatic vessel which passes by the side of those glands without communicating with them; and, bending towards the inside of the groin at (i), opens into the lymphatic gland (k). l l, Lymphatic glands in the groin, which are common to the lymphatic vessels of the genitals and those of the lower extremity. m, n, A plexus of lymphatic vessels passing on the inside of the iliac artery.

FIG. 2. Exhibits a Back View of the Lower Extremity, dissected so as to show the deeper-seated Lymphatic Vessels which accompany the Arteries.

A, the os pubis. B. The tuberosity of the ischium. C, That part of the os ilium which was articulated with the os sacrum. D, The extremity of the iliac artery appearing above the groin. E, The knee. F F, The two cut surfaces of the triceps muscle, which was divided to show the lymphatic vessels that pass through its perforation along with the crural artery. G, The edge of the musculus gracilis. H, The gastrocnemius and soleus, much shrunk by being dried, and by the soleus being separated from the

Of the Abdomen.

the tibia to expose the vessels. I, The heel. K, The sole of the foot. L, The superficial lymphatic vessels passing over the knee, to get to the thigh. On the out-lines; M, The posterior tibial artery. a, A lymphatic vessel accompanying the posterior tibial artery. b, The same vessel crossing the artery. c, A small lymphatic gland, thro' which this deep-seated lymphatic vessel passes. d, The lymphatic vessel passing under a small part of the soleus, which is left attached to the bone, the rest being removed. e, The lymphatic vessel crossing the popliteal artery. f, g, h, Lymphatic glands in the ham, through which the lymphatic vessel passes. i, The lymphatic vessel passing with the crural artery, through the perforation of the triceps muscle. k, The lymphatic vessel, after it has passed the perforation of the triceps, dividing into branches which embrace the artery (l). m, A lymphatic gland belonging to the deep-seated lymphatic vessel. At this place those vessels pass to the fore part of the groin, where they communicate with the superficial lymphatic vessels. n, A part of the superficial lymphatic vessel appearing on the brim of the pelvis.

Fig. 3. Exhibits the Trunk of the Human Subject, prepared to show the Lymphatic Vessels and the Ductus Thoracicus.

A, The neck. B B, The two jugular veins. C, The vena cava superior. D D D D, The subclavian veins. E, The beginning of the aorta, pulled to the left side by means of a ligature, in order to show the thoracic duct behind it. F, The branches arising from the curvature of the aorta. G G, The two carotid arteries. H H, The first ribs, I I, The trachea. K K, The spine. L L, the vena azygos M M, The descending aorta. N, The cœliac artery, dividing into three branches. O, The superior mesenteric artery. P, The right crus diaphragmatis. Q Q, The two kidneys. R, The right emulgent artery. S S, The external iliac arteries. g d, The musculi psoæ. T, The internal iliac artery. U, The cavity of the pelvis. X X, The spine of the os ilium. Y Y, The groins. *a*, A lymphatic gland in the groin, into which lymphatic vessels from the lower extremity are seen to enter. *b b*, The lymphatic vessels of the lower extremities passing under Poupart's ligament. *c c*, A plexus of the lymphatic vessels lying on each side of the pelvis. *d*, The psoas muscle with lymphatic vessels lying upon its inside. *e*, A plexus of lymphatics, which having passed over the brim of the pelvis at (*c*), having entered the cavity of the pelvis, and received the lymphatic vessels belonging to the viscera contained in that cavity, next ascends, and passes behind the iliac artery to (*g*). *f*, Some lymphatic vessels of the left side passing over the upper part of the os sacrum, to meet those of the right side. *g*, The right psoas, with a large plexus of lymphatics lying on its inside *h h*, The plexus lying on each side of the spine. *i i i*, Spaces occupied by the lymphatic glands. *k*, The trunk of the lacteals, lying on the under side of the superior mesenteric artery. *l*, The same dividing into two branches, one of which passes on each side of the aorta; that of the right side being seen to enter the thoracic duct at (*m*). *m*, The thoracic duct beginning from the large lymphatics. *n*, The duct passing under the lower part of the crus diaphragmatis, and under the right emulgent artery. *o*, The thoracic duct penetrating the thorax. *p*, Some lymphatic vessels joining that duct in the thorax. *q*, The thoracic duct passing under the curvature of the aorta to get to the left subclavian vein. The aorta being drawn aside to show the duct. *r*, A plexus of lymphatic vessels passing upon the trachea from the thyroid gland to the thoracic duct.

Of the Abdomen.

Plate XXVII.

Fig 1. Represents the Under and Posterior Side of the Bladder of Urine, &c.

a, The bladder, b b, The insertion of the ureters. c c, The vasa deferentia, which convey the semen from the testicles to d d, The vesiculæ seminales,—and pass through e, The prostrate gland, to discharge themselves into f, The beginning of the urethra.

Fig. 2. A transverse Section of the Penis.

g g, Corpora cavernosa penis. h, Corpus cavernosum urethræ. i, Urethra. k, Septum penis. l l, The septum between the corpus cavernosum urethræ and that of the penis.

Fig. 3. A Longitudinal Section of the Penis.

m m, The corpora cavernosa penis, divided by o, The septum penis. n, The corpus cavernosum glandis, which is the continuation of that of the urethra.

Fig. 4. Represents the Female Organs of Generation.

a, That side of the uterus which is next the os sacrum. 1, Its fundus. 2, Its cervix. b b, The Fallopian or uterine tubes, which open into the cavity of the uterus;—but the other end is open within the pelvis, and surrounded by c c, The fimbriæ. d d, The ovaria. e, The os internum uteri, or mouth of the womb. f f, The ligamenta rotunda, which passes without the belly, and is fixed to the labia pudendi. g g, The cut edges of the ligamenta lata, which connects the uterus to the pelvis. h, The inside of the vagina. i, The orifice of the urethra. k, The clitoris surrounded by (l,) The præputium. m m, The labia pudendi. n n, The nymphæ.

Fig. 5. Shows the Spermatic Ducts of the Testicle filled with Mercury.

A, The vas deferens. B, Its beginning, which forms the posterior part of the epididymis. C, The middle of the epididymis, composed of serpentine ducts. D, The head or anterior part of the epididymis unravelled. e e e e, The whole ducts which compose the head of the epididymis unravelled. f f, The vasa deferentia. g g, Rete testis. h h, Some rectilineal ducts which send off the vasa deferentia. i i, The substance of the testicle.

Fig. 6. The right Testicle entire, and the Epididymis filled with Mercury.

A, The beginning of the vas deferens. B, The vas deferens ascending towards the abdomen. C, The posterior part of the epididymis, named *globus minor*. D, The spermatic vessels inclosed in cellular substance. E, The body of the epididymis. F, Its head, named *globus major*. G, Its beginning from the testicle. H, The body of the testicle, inclosed in the tunica albuginea.

Fig. 1

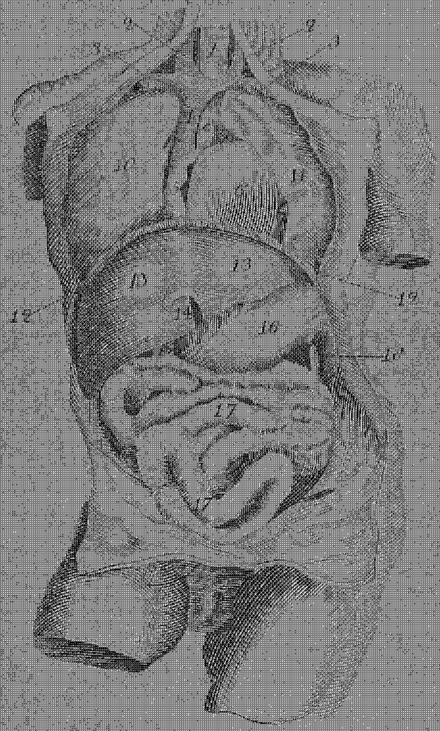


Fig. 2

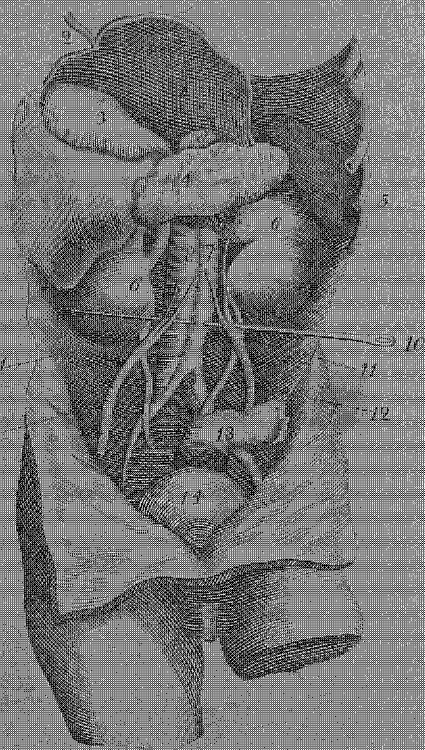


Fig. 3

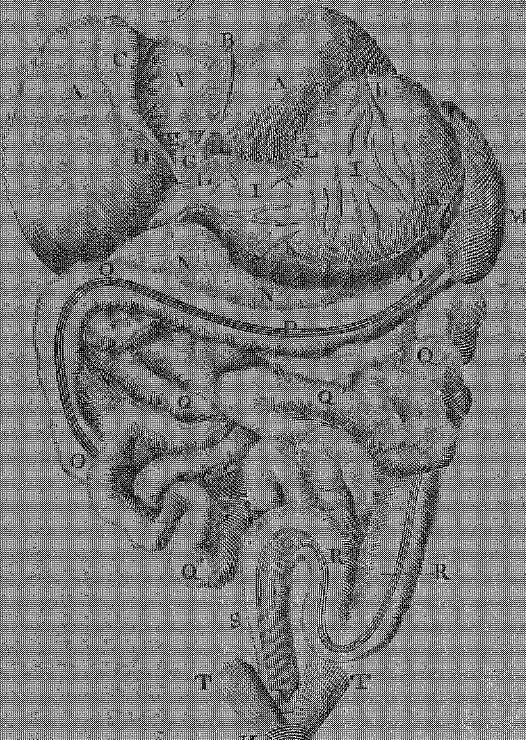


Fig. 4

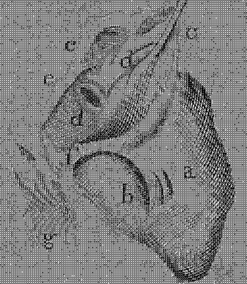
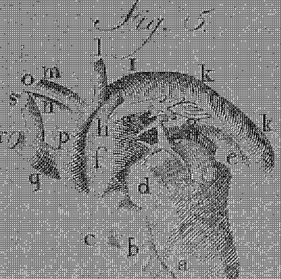


Fig. 5



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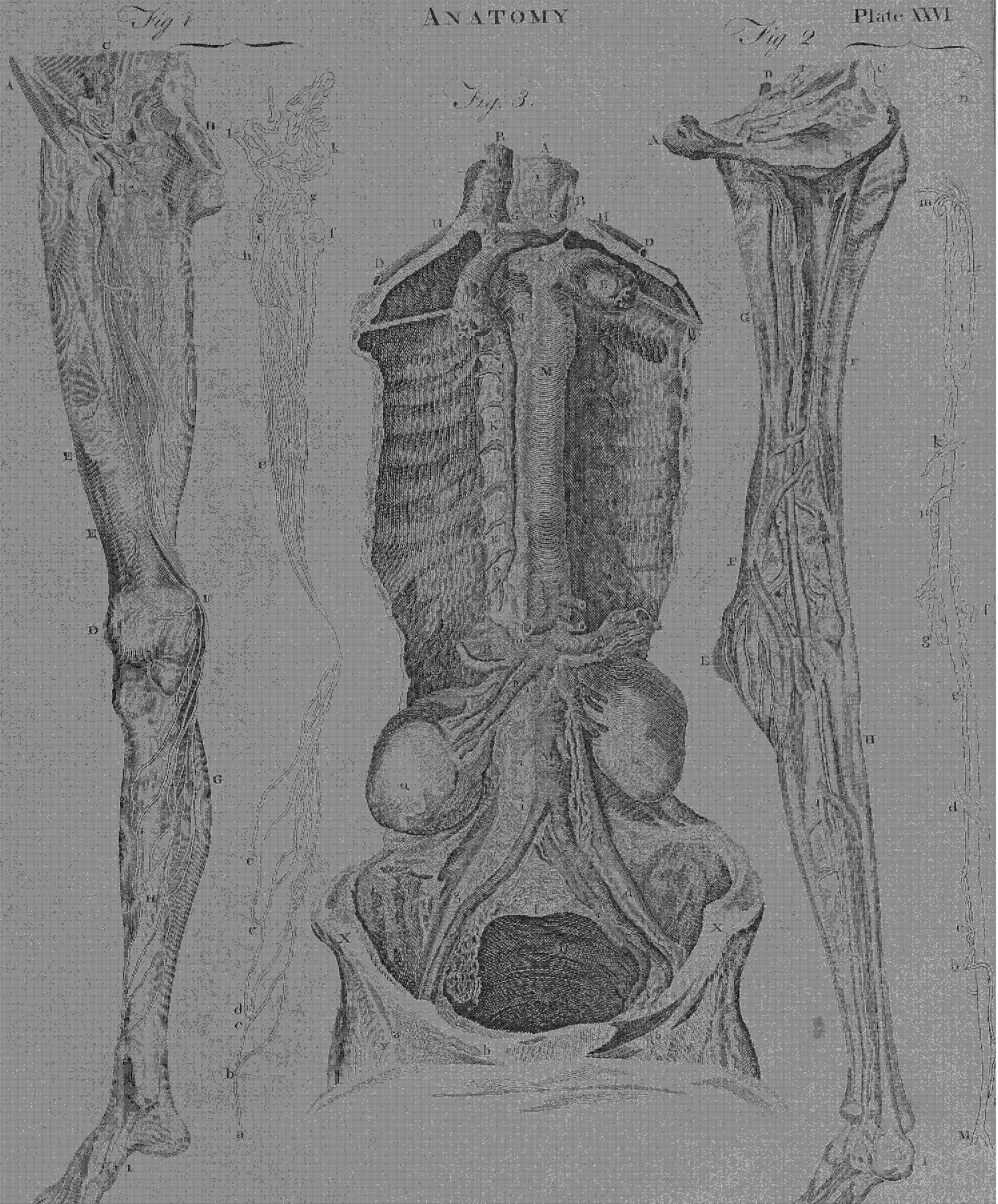
ANATOMY Plate XXVI



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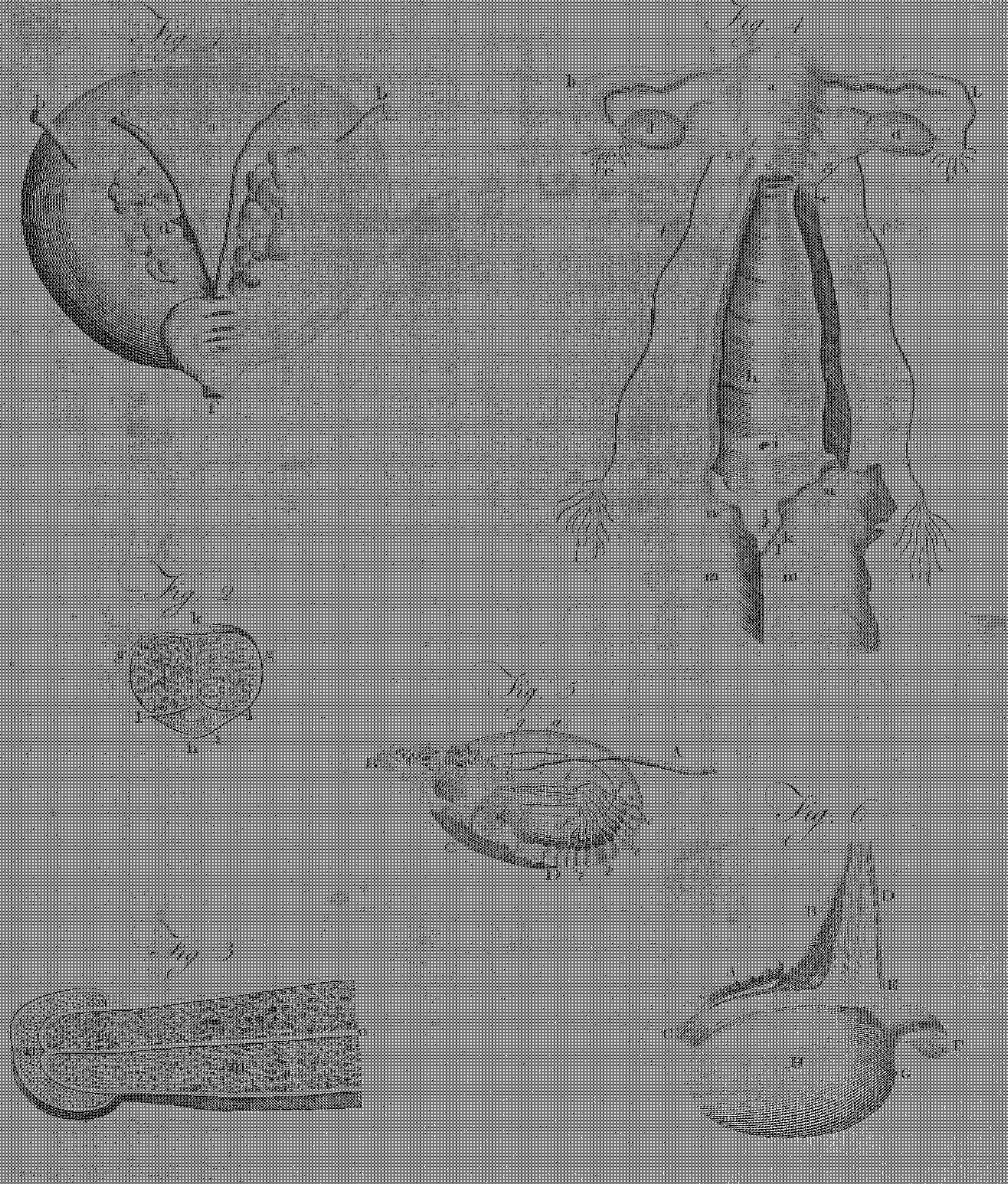

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Part IV. Of the THORAX.

114 Of the cheſt. THE THORAX, or CHEST, is that cavity of the trunk which extends from the clavicles, or the lower part of the neck, to the diaphragm, and includes the vital organs, which are the heart and lungs; and likewiſe the trachea and œſophagus.—This cavity is formed by the ribs and vertebræ of the back, covered by a great number of muſcles, and by the common integuments, and anteriorly by two glandular bodies called the *breaſts*. The ſpaces between the ribs are filled up by muſcular fibres, which from their ſituation are called *intercoſtal muſcles*.

Sect. I. *Of the Breaſts.*

115. THE *breaſts* may be defined to be two large conglomerate glands, mixed with a good deal of adipoſe membrane. The glandular part is compoſed of an infinite number of minute arteries, veins, and nerves.

The arteries are derived from two different trunks; one of which is called the *internal*, and the other the *external mammary artery*. The firſt of theſe ariſes from the ſubclavian, and the latter from the axillary.

The veins every where accompany the arteries, and are diſtinguiſhed by the ſame name. The nerves are chiefly from the vertebral pairs. Like all other conglomerate glands, the breaſts are made up of a great many ſmall diſtinct glands, in which the milk is ſecreted from the ultimate branches of arteries. The excretory ducts of theſe ſeveral glands gradually uniting as they approach the nipple, from the tubuli lactiferi, which are uſually more than a dozen in number, and open at its apex, but have little or no communication, as has been ſuppoſed, at the root of the nipple. Theſe ducts, in their courſe from the glands, are ſurrounded by a ligamentary elaſtic ſubſtance, which terminates with them in the nipple. Both this ſubſtance, and the ducts which it contains, are capable of conſiderable extenſion and contraction; but in their natural ſtate are moderately corrugated, ſo as to prevent an involuntary flow of milk, unleſs the diſtending force be very great from the accumulation of too great a quantity.

The whole ſubſtance of the nipple is very ſpongy and elaſtic: its external ſurface is uneven, and full of ſmall tubercles. The nipple is ſurrounded with a diſk or circle of a different colour, called the *areola*; and on the inſide of the ſkin, under the areola, are many ſebaceous glands, which pour out a mucus to defend the areola and nipple: for the ſkin upon theſe parts is very thin; and the nervous papillæ lying very bare, are much expoſed to irritation.

The breaſts are formed for the ſecretion of milk, which is deſtined for the nouriſhment of the child for ſome time after its birth. This ſecretion begins to take place ſoon after the delivery, and continues to flow for many months in very large quantities, if the woman ſuckles her child.

The operation of ſuction depends on the principles of the air-pump, and the flow of milk through the lactiferous tubes is facilitated by their being ſtretched out.

The milk, examined chemically, appears to be compoſed of oil, mucilage, and water, and of a conſiderable quantity of ſugar. The generality of phyſiologiſts have ſuppoſed that, like the chyle, it frequently retains the properties of the aliment and medicines taken into the ſtomach; but from ſome late experiments*, this ſuppoſition appears to be ill-founded.

* *Journ. de Med.* 1781.

Sect. II. *Of the Pleura.*

THE cavity of the thorax is every where lined by a membrane of a firm texture called *pleura*. It is compoſed of two diſtinct portions or bags, which, by being applied to each other laterally, form a ſeptum called *mediaſtinum*; which divides the cavity into two parts, and is attached poſteriorly to the vertebræ of the back, and anteriorly to the ſternum. But the two laminæ of which this ſeptum is formed, do not every where adhere to each other; for at the lower part of the thorax they are ſeparated, to afford a lodgement to the heart; and at the upper part of the cavity, they receive between them the thymus. 116.

The pleura is plentifully ſupplied with arteries and veins from the internal mammary and the intercoſtals. Its nerves, which are very inconſiderable, are derived chiefly from the dorſal and intercoſtal nerves.

The ſurface of the pleura, like that of the peritonæum and other membranes lining cavities, is conſtantly bedewed with a ſerous moiſture (w) which prevents adheſion of the viſcera.

The mediaſtinum, by dividing the breaſt into two cavities, obviates many inconveniences, to which we ſhould otherwiſe be liable. It prevents the two lobes of the lungs from compreſſing each other when we lie on one ſide; and conſequently contributes to the freedom of reſpiration, whch is diſturbed by the leaſt preſſure on the lungs. If the point of a ſword penetrates between the ribs into the cavity of the thorax, the lungs on that ſide ceaſe to perform their office; becauſe the air being admitted through the wound, prevents the dilatation of that lobe; while the other lobe, which is ſeparated from it by the mediaſtinum, remains unhurt, and continues to perform its function as uſual.

Sect. III. *Of the Thymus.*

THE *thymus* is a glandular ſubſtance, the uſe of which is not perfectly aſcertained, its excretory duct not having yet been diſcovered. It is of an oblong

(w) When this fluid is exhaled in too great a quantity, or is not properly carried off, it accumulates and conſtitutes the hydrops pectoris.

Of the Thorax.

figure, and is larger in the fœtus and in young children than in adults, being sometimes nearly effaced in very old subjects. It is placed in the upper part of the thorax, between the two laminæ of the mediastinum; but at first is not altogether contained within the cavity of the chest, being found to border upon the upper extremity of the sternum.

Sect. IV. *Of the Diaphragm.*

118. The cavity of the thorax is separated from that of the abdomen, by a fleshy and membranous septum called the *diaphragm* or *midriff*. The greatest part of is composed of muscular fibres; and on this account systematic writers usually place it very properly among the muscles. Its middle part is very tendinous, and it is covered by the pleura above, and by the peritonæum below. It seems to have been improperly named *septum transversum*, as it does not make a plain transverse division of the two cavities, but forms a kind of vault, the fore part of which is attached to the sternum. Laterally it is fixed to the last of the true ribs, and to all the false ribs; and its lower and posterior part is attached to the vertebræ lumborum, where it may be said to be divided into two portions or crura (x).

The principal arteries of the diaphragm are derived from the aorta, and its veins pass into the vena cava. Its nerves are chiefly derived from the cervical pairs. It affords a passage to the vena cava through its tendinous part, and to the œsophagus through its fleshy portion. The aorta passes down behind it between its crura.

The diaphragm not only serves to divide the thorax from the abdomen, but by its muscular structure is rendered one of the chief agents in respiration. When its fibres contract, its convex side, which is turned towards the thorax, becomes gradually flat, and by increasing the cavity of the breast, affords room for a complete dilatation of the lungs, by means of the air which is then drawn into them by the act of inspiration. The fibres of the diaphragm then relax; and as it resumes its former state, the cavity of the thorax becomes gradually diminished, and the air is driven out again from the lungs by a motion contrary to the former one, called *expiration*.

It is in some measure by means of the diaphragm, that we void the fæces at the anus, and empty the urinary bladder. Besides these offices, the acts of coughing, sneezing, speaking, laughing, gaping, and sighing, could not take place without its assistance; and the gentle pressure which all the abdominal viscera receive from its constant and regular motion, cannot fail to assist in the performance of the several functions which were ascribed to those viscera.

Sect. V. *Of the Trachea.*

119. The trachea or windpipe, is a cartilaginous and membranous canal, through which the air passes into the lungs. Its upper part, which is called the *larynx*, is composed of five cartilages. The uppermost of these cartilages is placed over the glottis or mouth of the larynx, and is called *epiglottis*, which has been before spoken of, as closing the passage to the lungs in the act of swallowing. At the sides of the glottis are placed the two arytenoide cartilages, which are of a very complex figure, not easy to be described. The anterior and larger part of the larynx is made up of two cartilages: one of which is called *thyroïdes* or *scutiformis*, from its being shaped like a buckler; and the other *cricoides* or *annularis*, from its resembling a ring. Both these cartilages may be felt immediately under the skin, at the fore part of the throat, and the thyroides, by its convexity, forms an eminence called *pomum adami*, which is usually more considerable in the male than in the female subject.

All these cartilages are united to each other by means of very elastic, ligamentous fibres; and are enabled, by the assistance of their several muscles, to dilate or contract the passage of the larynx, and to perform that variety of motion which seems to point out the larynx as the principal organ of the voice; for when the air passes out through a wound in the trachea, it produces no sound.

These cartilages are moistened by a mucus, which seems to be secreted by minute glands situated near them. The upper part of the trachea is covered anteriorly and laterally by a considerable body, which is supposed to be of a glandular structure, and from its situation near the thyroid cartilage is called the *thyroid gland*; though its excretory duct has not yet been discovered, or its real use ascertained.

The glottis is interiorly covered by a very fine membrane, which is moistened by a constant supply of a watery fluid. From the larynx the canal begins to take the name of *trachea* or *aspera arteria*, and extends from thence as far down as the third or fourth vertebra of the back, where it divides into two branches, which are the right and left bronchial tube. Each of these bronchi (y) ramifies through the substance of that lobe of the lungs to which it is distributed, by an infinite number of branches, which are formed of cartilages separated from each other like those of the trachea, by an intervening membranous and ligamentary substance. Each of these cartilages is of an angular figure; and as they become gradually less and less in their diameter, the lower ones in some measure received into those above them, when the lungs, after being inflated, gradually collapse by the air being pushed

(x) Anatomical writers have usually described the diaphragm as being made up of two muscles united by a middle tendon; and these two portions or crura form what they speak of as the *inferior muscle*, arising from the sides and fore part of the vertebræ.

(y) The right bronchial tube is usually found to be somewhat shorter and thicker than the left; and M. Portal, who has published a memoir on the action of the lungs on the aorta in respiration, observes, that the left bronchial tube is closely connected by the aorta; and from some experiments he is induced to conclude, that in the first respirations, the air only enters into the right lobe of the lungs. *Memoires de l' Academie Royale des Sciences*, 1769.

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ed out from them in exſpiration. As the branches of the bronchi become more minute, their cartilages become more and more angular and membranous, till at length they are found to be perfectly membranous, and at laſt become inviſible.

The trachea is furniſhed with fleſhy or muſcular fibres; ſome of which paſs through its whole extent longitudinally, while the others are carried round it in a circular direction; ſo that by the contraction or relaxation of theſe fibres, it is enabled to ſhorten or lengthen itſelf, and likewiſe to dilate or contract the diameter of its paſſage.

The trachea and its branches, in all their ramifications, are furniſhed with a great number of ſmall glands which are lodged in their cellular ſubſtance, and diſcharge a mucous fluid on the inner ſurface of theſe tubes.

The cartilages of the trachea, by keeping it conſtantly open, afford a free paſſage to the air, which we are obliged to be inceſſantly reſpiring; and its membranous part, by being capable of contraction and dilatation, enables us to receive and expel the air in a greater or leſs quantity, and with more or leſs velocity, as may be required in ſinging or in declamation. This membranous ſtructure of the trachea poſteriorly, ſeems likewiſe to aſſiſt in the deſcent of the food, by preventing that impediment to its paſſage down the œſophagus, which might be expected if the cartilages were complete rings.

The trachea receives its arteries from the carotid and ſubclavian arteries, and its veins paſs into the jugulars. Its nerves ariſe from the recurrent branch of the eighth pair, and from the cervical plexus.

Sect. VI. *Of the Lungs.*

117. The lungs fill the greater part of the cavity of the breaſt. They are of a ſoft and ſpungy texture, and are divided into two lobes, which are ſeparated from each other by the mediaſtinum, and are externally covered by a production of the pleura. Each of theſe is divided into two or three leſſer lobes; and we commonly find three in the right ſide of the cavity, and two in the left.

To diſcover the ſtructure of the lungs, it is required to follow the ramifications of the bronchi, which were deſcribed in the laſt ſection. Theſe becoming gradually more and more minute, at length terminate in the cellular ſpaces or veſicles, which make up the greateſt part of the ſubſtance of the lungs, and readily communicate with each other.

The lungs ſeem to poſſeſs but little ſenſibility. Their nerves, which are ſmall, and few in number, are derived from the intercoſtal and eighth pair. This laſt pair having reached the thorax, ſends off a branch on each ſide of the trachea, called the *recurrent*, which reaſcends at the back of the trachea, to which it furniſhes branches in its aſcent, as well as to the œſophagus, but it is chiefly diſtributed to the larynx and its muſcles. By dividing the recurrent and ſuperior laryngeal nerves at their origin, an animal is deprived of its voice.

There are two ſeries of arteries which carry blood to the lungs: theſe are the arteriæ bronchiales, and the pulmonary artery.

The arteriæ branchiales begin uſually by two branches; one of which commonly ariſes from the right intercoſtal, and the other from the trunk of the aorta: but ſometimes there are three of theſe arteries, and in ſome ſubjects only one. The uſe of theſe arteries is to ſerve for the nouriſhment of the lungs, and their ramifications are ſeen creeping every where on the branches of the bronchi. The blood is brought back from them by the bronchial vein into the vena azygos.

The pulmonary artery and vein are not intended for the nouriſhment of the lungs; but the blood in its paſſage through them is deſtined to undergo ſome changes, or to acquire certain eſſential properties (from the action of the air), which it has loſt in its circulation through the other parts of the body. The pulmonary artery receives the blood from the right ventricle of the heart, and dividing into two branches, accompanies the bronchi every where, by its ramifications through the lungs; and the blood is afterwards conveyed back by the pulmonary vein, which gradually forming a conſiderable trunk, goes to empty itſelf into the left ventricle of the heart; ſo that the quantity of blood which enters into the lungs, is perhaps greater than that which is ſent in the ſame proportion of time through all the other parts of the body.

Sect. VII. *Of Reſpiration.*

Respiration conſtitutes one of thoſe functions which are properly termed *vital*, as being eſſential to life; for to live and to breathe are in fact ſynonymous terms. It conſiſts in an alternate contraction and dilatation of the thorax, by firſt inſpiring air into the lungs, and then expelling it from them in exſpiration. 118.

It will perhaps be eaſy to diſtinguiſh and point out the ſeveral phenomena of reſpiration; but to explain their phyſical cauſe will be attended with difficulty: for it will naturally be enquired, how the lungs, when emptied of the air, and contracted by exſpiration, become again inflated, they themſelves being perfectly paſſive? How the ribs are elevated in oppoſition to their own natural ſituation? and why the diaphragm is contracted downwards towards the abdomen? Were we to aſſert that the air, by forcing its way into the cavity of the lungs, dilated them, and conſequently elevated the ribs, and preſſed down the diaphragm, we ſhould ſpeak erroneouſly. What induces the firſt inſpiration, it is not eaſy to aſcertain; but after an animal has once reſpired, it would ſeem likely that the blood, after exſpiration, finding its paſſage through the lungs obſtructed, becomes a ſtimulus, which induces the intercoſtal muſcles and the diaphragm to contract, and enlarge the cavity of the thorax, in conſequence perhaps of a certain nervous influence, which we will not here attempt to explain. The air then ruſhes into the lungs; every branch of the bronchial tubes, and all the cellular ſpaces into which they open, become fully dilated; and the pulmonary veſſels being equally diſtended, the blood flows through them with eaſe. But as the ſtimulus which firſt occaſioned this dilatation ceaſes to operate, the muſcles gradually contract, the diaphragm riſes upwards again, and diminiſhes the cavity of the cheſt; the ribs return to their former ſtate; and as the air paſſes out in exſpiration, the lungs gradually collapſe, and a reſiſtance to the paſſage of the blood again takes place. But the heart continuing to receive and expel the blood

blood, the pulmonary artery begins again to be distended, the stimulus is renewed, and the same progress is repeated, and continues to be repeated, in a regular succession, during life: for though the muscles of respiration, having a mixed motion, are (unlike the heart) in some measure dependent on the will, yet no human being, after having once respired, can live many moments without it. In an attempt to hold one's breath, the blood soon begins to distend the veins, which are unable to empty their contents into the heart; and we are able only, during a very little time, to resist the stimulus to inspiration. In drowning, the circulation seems to be stopped upon this principle; and in hanging, the pressure made on the jugular veins, may cooperate with the stoppage of respiration in bringing on death.

Till within these few years physiologists were entirely ignorant of the use of respiration. It was at length discovered in part by the illustrious Dr Priestley. He found that the air exspired by animals was phlogisticated; and that the air was fitter for respiration, or for supporting animal life, in proportion as it was freer from the phlogistic principle. It had long been observed, that the blood in passing through the lungs acquired a more florid colour. He therefore suspected, that it was owing to its having imparted phlogiston to the air: and he satisfied himself of the truth of this idea by experiments, which showed, that the crassementum of extravassated blood, phlogisticated air in proportion as it lost its dark colour. He farther found, that blood thus reddened had a strong attraction for phlogiston; insomuch that it was capable of taking it from phlogisticated air, thereby becoming of a darker colour. From hence it appeared that the blood, in its circulation through the arterial system, imbibes a considerable quantity of phlogiston, which is discharged from it to the air in the lungs.

This discovery has since been prosecuted by two very ingenious physiologists, Dr Crawford and Mr Elliot. It has been shown by professors Black and Irvine, that different bodies have different capacities for containing fire. For example, that oil and water, when equally hot to the sense and the thermometer, contain different proportions of that principle; and that unequal quantities of it are required, in order to raise those substances to like temperatures. The enquiries of Dr Crawford and Mr Elliot tend to prove, that the capacities of bodies for containing fire are diminished by the addition of phlogiston, and increased by its separation: the capacity of calx of antimony, for example, being greater than that of the antimony itself. Common air contains a great quantity of fire; combustible bodies very little. In combustion, a double elective attraction takes place; the phlogiston of the body being transferred to the air, the fire contained in the air to the combustible body. But as the capacity of the latter is not increased so much as that of the former is diminished, only part of the extricated fire will be absorbed by the body. The remainder therefore will raise the temperature of the compound; and hence we may account for the heat attending combustion. As the use of respiration is to dephlogisticate the blood, it seems probable, that a like double elective attraction takes place in this process; the phlogiston of the blood being transferred to the air, and the fire contained in the air to the blood; but with this difference, that the capacities being equal, the whole of the extricated fire is absorbed by the latter. The blood in this state circulating through the body, imbibes phlogiston, and of course gives out its fire; part only of which is absorbed by the parts furnishing the phlogiston, the remainder, as in combustion, becoming sensible; and is therefore the cause of the heat of the body, or what is called animal heat.

In confirmation of this doctrine it may be observed, that the venous blood contains less fire than the arterial; combustible bodies less than incombustible ones; and that air contains less of this principle, according as it is rendered, by combination with phlogiston, less fit for respiration (z).

In ascending very high mountains, respiration is found to become short and frequent, and sometimes to be attended with a spitting of blood. These symptoms seem to be occasioned by the air being too rare and thin to dilate the lungs sufficiently; and the blood gradually accumulating in the pulmonary vessels, sometimes bursts through their coats, and is brought up by coughing. This has likewise been accounted for in a different way, by supposing that the air contained in the blood, not receiving an equal pressure from that of the atmosphere, expands, and at length ruptures the very minute branches of the pulmonary vessels; upon the same principle that fruits and animals put under the receiver of an air-pump, are seen to swell as the outer air becomes exhausted. But Dr Darwin of Litchfield has lately published some experiments, which seem to prove, that no air or elastic vapour does exist in the blood-vessels, as has been generally supposed; and he is induced to impute the spitting of blood, which has sometimes taken place in ascending high mountains, to accident, or to violent exertions; as it never happens to animals that are put into the exhausted receiver of an air-pump, where the diminution of pressure is many times greater than on the summit of the highest mountains.

Sect. VIII. *Of the Voice.*

Respiration has already been described as affording us many advantages; and next to that of life, its most important use seems to be that of forming the voice and speech. The ancients, and almost all the moderns, have considered the organ of speech as a kind of musical instrument, which may be compared to a flute, to an hautboy, to an organ, &c. and they argue after the following manner.

The trachea, which begins at the root of the tongue, and goes to terminate in the lungs, may be compared to the pipe of an organ, the lungs dilating like bellows during the time of inspiration; and as the air is driven out from them in exspiration, it finds its passage straitened by the cartilages of the larynx, against which it strikes.

(z) See Crawford's Experiments and Observations on Animal Heat, and Elliot's Philosophical observations.

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ſtrikes. As theſe cartilages are more or leſs elaſtic, they occaſion in their turn more or leſs vibration in the air, and thus produce the ſound of the voice; the variation in the ſound and tone of which depends on the ſtate of the glottis, which, when ſtraitened, produces an acute tone, and a grave one when dilated.

The late M. Ferein communicated to the French Academy of Sciences a very ingenious theory on the formation of the voice. He conſidered the organ of the voice as a *ſtring*, as well as a *wind*, inſtrument; ſo that what art has hitherto been unable to conſtruct, and what both the fathers Merſenne and Kircher, ſo much wiſhed to ſee, M. Ferein imagined he had at length diſcovered in the human body. He obſerves, that there are at the edges of the glottis certain tendinous chords, placed horizontally acroſs it, which are capable of conſiderable vibration, ſo as to produce ſound, in the ſame manner as it is produced by the ſtrings of a violin or a harpſichord; and he ſuppoſes that the air, as it paſſes out from the lungs, acts as a bow on theſe ſtrings, while the efforts of the breaſt and lungs regulate its motion, and produce the variety of tones. So that according to this ſyſtem the variation in the voice is not occaſioned by the dilatation or contraction of the glottis, but by the diſtenſion or relaxation of theſe ſtrings, the ſound being more or leſs acute in proportion as they are more or leſs ſtretched out. Another writer on this ſubject ſuppoſes, that the organ of voice is a double inſtrument, which produces in uniſon two ſounds of a different nature; one by means of the air, and the other by means of the chords of the glottis. Neither of theſe ſyſtems, however, are univerſally adopted. They are both liable to inſuperable difficulties; ſo that the manner in which the voice is formed has never yet been ſatiſfactorily aſcertained: we may obſerve, however, that the ſound produced by the glottis is not articulated. To effect this, it is required to paſs through the mouth, where it is differently modified by the action of the tongue, which is either puſhed againſt the teeth, or upwards towards the palate; detaining it in its paſſage, or permitting it to flow freely, by contracting or dilating the mouth.

Sect. IX. *Of Dejection.*

123. By dejection we mean the act of voiding the fæces at the anus; and an account of the manner in which this is conducted was reſerved for this part of the work, becauſe it ſeemed to require a knowledge of reſpiration to be perfectly underſtood.

The inteſtines were deſcribed as having a periſtaltic motion, by which the fæces were gradually advancing towards the anus. Now, whenever the fæces are accumulated in the inteſtinum rectum in a ſufficient quantity to become troubleſome, either by their weight or acrimony, they excite a certain uneaſineſs which induces us to go to ſtool.—To effect this, we begin by making a conſiderable inſpiration; in conſequence of which the diaphragm is carried downwards towards the lower belly; the abdominal muſcles are at the ſame time contracted in obedience to the will; and the inteſtines being compreſſed on all ſides, the reſiſtance of the *ſphincter* is overcome, and the fæces paſs out at the anus; which is afterwards drawn up by its longitudinal fibres, which are called *levatoris ani*, and then by means of its *ſphincter* is again contracted; but it ſometimes happens, as in dyſenteries for inſtance, that the fæces are very liquid, and have conſiderable acrimony; and then the irritation they occaſion is more frequent, ſo as to promote their diſcharge without any preſſure from the diaphragm or abdominal muſcles; and ſometimes involuntarily, as is the caſe when the ſphincter becomes paralytic.

Sect. X. *Of the Pericardium, and of the Heart and its Auricles.*

The two membraneous bags of the pleura, which were deſcribed as forming the mediaſtinum, recede one from the other, ſo as to afford a lodgement to a firm membranous ſac, in which the heart is ſecurely lodged; this ſac, which is the *pericardium*, appears to be compoſed of two tunics, united to each other by cellular membrane.—The outer coat, which is thick, and in ſome places of a tendinous complexion, is a production of the mediaſtinum; the inner coat, which is extremely thin, is reflected over the auricles and ventricles of the heart, in the ſame manner as the tunica conjunctiva, after lining the eye lids, is reflected over the eye. 124 Pericardium.

This bag adheres to the tendinous part of the diaphragm, and contains a coagulable lymph, the *liquor pericardii*, which ſerves to lubricate the heart and facilitate its motions; and ſeems to be ſecreted and abſorbed in the ſame manner as it is in the other cavities of the body.

The arteries of the pericardium are derived from the phrenic, and its veins paſs into veins of the ſame name; its nerves are likewiſe branches of the phrenic.

The ſize of the pericardium is adapted to that of the heart, being uſually large enough to contain it looſely. As its cavity does not extend to the ſternum, the lungs cover it in inſpiration; and as it every where inveſts the heart, it effectually ſecures it from being injured by lymph, pus, or any other fluid, extravaſated into the cavities of the thorax.

The heart is a hollow muſcle of a conical ſhape, ſituated tranſverſely between the two laminæ of the mediaſtinum, at the lower part of the thorax; having its baſis turned towards the right ſide, and its point or apex towards the left.—Its lower ſurface is ſomewhat flattened towards the diaphragm. Its baſis, from which the great veſſels originate, is covered with fat, and it has two hollow and fleſhy appendages, called *auricles*.—Round theſe ſeveral openings, the heart ſeems to be of a firm ligamentous texture, from which all its fibres ſeem to originate; and as they advance from thence towards the apex, the ſubſtance of the heart ſeems to become thinner. 125 Heart, and its auricles.

The heart includes two cavities or *ventricles*, which are ſeparated from each other by a fleſhy ſeptum; one of theſe is called the *right*, and the other the *left*, *ventricle*; though perhaps, with reſpect to their ſituation, it would be more proper to diſtinguiſh them into the *anterior* and *poſterior ventricles*.

The heart is exteriorly covered by a very fine membrane; and its ſtructure is perfectly muſcular or fleſhy, being compoſed of fibres which are deſcribed as paſſing in different directions; ſome as being extended longitudinally from the baſis to the apex; others, as taking an oblique or ſpiral courſe; and a third ſort as being

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being placed in a tranverſe direction (A).—Within the two ventricles we obſerve ſeveral furrows; and there are likewiſe tendinous ſtrings, which ariſe from fleſhy *columnæ* in the two cavities, and are attached to the valves of the auricles: That the uſe of theſe and the other valves of the heart may be underſtood, it muſt be obſerved, that four large veſſels paſs out from the baſis of the heart, viz. two arteries and two veins; and that each of theſe veſſels is furniſhed with a thin membranous production, which is attached all round to the borders of their ſeveral orifices, from whence hanging looſely down they appear to be divided into two or three diſtinct portions. But as their uſes in the arteries and veins are different, ſo are they differently diſpoſed. Thoſe of the arteries are intended to give way to the paſſage of the blood into them from the ventricles, but to oppoſe its return: and, on the contrary, the valves of the veins are conſtructed ſo as to allow the blood only to paſs into the heart. In conſequence of theſe different uſes, we find the valves of the pulmonary artery and of the aorta attached to the orifices of thoſe veſſels, ſo as to have their concave ſurfaces turned towards the artery: and their convex ſurfaces, which mutually meet together, being placed towards the ventricle, only permit the blood to paſs one way, which is into the arteries. There are uſually three of theſe valves belonging to the pulmonary artery, and as many to the aorta; and from their figure they are called *valvulæ ſemilunares*. The communication between the two great veins and the ventricles is by means of the two appendages or auricles into which the blood is diſcharged; ſo that the other valves which may be ſaid to belong to the veins, are placed in each ventricle, where the auricle opens into it. The valves in the right ventricle are uſually three in number, and are named *valvulæ tricuſpides*; but in the left ventricle we commonly obſerve only two, and theſe are the *valvulæ mitrales*. The membranes which form theſe valves in each cavity are attached ſo as to project ſomewhat forward; and both the *tricuſpides* and the *mitrales* are connected with the tendinous ſtrings, which were deſcribed as ariſing from the fleſhy *columnæ*. By the contraction of either ventricle, the blood is driven into the artery which communicates with that ventricle; and theſe tendinous ſtrings being gradually relaxed as the ſides of the cavity are brought nearer to each other, the valves naturally cloſe the opening into the auricle, and the blood neceſſarily directs its courſe into the then only open paſſage, which is into the artery; but after this contraction, the heart becomes relaxed, the tendinous ſtrings are again ſtretched out, and, drawing the valves of the auricle downwards, the blood is poured by the veins into the ventricle, from whence, by another contraction, it is again thrown into the artery, as will be deſcribed hereafter. The right ventricle is not quite ſo long, though ſomewhat larger, than the left; but the latter has more ſubſtance than the other: and this ſeems to be, becauſe it is intended to tranſmit the blood to the moſt diſtant parts of the body, whereas the right ventricle diſtributes it only to the lungs.

The heart receives its nerves from the par vagum and the intercoſtals. The arteries which ſerve for its nouriſhment are two in number, and ariſe from the aorta. They ſurround in ſome meaſure the baſis of the heart, and from this courſe are called the *coronary arteries*. From theſe arteries the blood is returned by veins of the ſame name into the auricles, and even into the ventricles.

The muſcular bags called the *auricles* are ſituated at the baſis of the heart, at the ſides of each other; and correſponding with the two ventricles, are like thoſe two cavities diſtinguiſhed into *right* and *left*. Theſe ſacs, which are interiorly unequal, have externally a jagged appendix; which, from its having been compared to the extremity of an ear, has given them their name of *auricles*.

SECT. XI. *Angiology, or a Deſcription of the Blood-veſſels.*

THE heart has been deſcribed as contracting itſelf, and throwing the blood from its two ventricles into the pulmonary artery and the aorta, and then as relaxing itſelf and receiving a freſh ſupply from two large veins, which are the pulmonary vein and the vena cava. We will now point out the principal diſtributions of theſe veſſels. 126

The *pulmonary artery* ariſes from the right ventricle by a large trunk, which ſoon divides into two conſiderable branches, which paſs to the right and left lobes of the lungs: each of theſe branches is afterwards divided and ſubdivided into an infinite number of branches and ramifications, which extend through the whole ſubſtance of the lungs; and from theſe branches the blood is returned by the veins, which, contrary to the courſe of the arteries, begin by very minute canals, and gradually become larger, forming at length four large trunks called *pulmonary veins*, which terminate in the *left auricle* by one common opening, from whence the blood paſſes into the *left ventricle*. From this ſame ventricle raiſes the *aorta* or *great artery*, which at its beginning is nearly an inch in diameter: it ſoon ſends off two branches, the *coronaries*, which go to be diſtributed to the heart and its auricles. After this, at or about the third or fourth vertebra of the back, it makes a conſiderable curvature; from this curvature (B) ariſe three arteries; one of which ſoon divides into two branches. The firſt two are the left ſubclavian and the left carotid, and the third is a common trunk to the right ſubclavian and right carotid; though ſometimes both the carotids ariſe diſtinctly from the aorta.

The two *carotids* aſcend within the ſubclavians, along the ſides of the trachea; and when they have reached the larynx, divide into two principal branches, the *internal* and *external carotid*. The firſt of theſe runs a little

(A) Authors differ about the courſe and diſtinctions of theſe fibres; and it ſeems right to obſerve, that the ſtructure of the heart being more compact than that of other muſcles, its fibres are not eaſily ſeparated.

(B) Anatomiſts uſually call the upper part of this curvature *aorta aſcendens*; and the other part of the artery to its diviſion at the iliacs, *aorta deſcendens*: but they differ about the place where this diſtinction is to be introduced; and it ſeems ſufficiently to anſwer every purpoſe, to ſpeak only of the aorta and its curvature.

Of the Thorax.

little way backwards in a bending direction; and having reached the under part of the ear, passes through the canal into the os petrosum, and entering into the cavity of the cranium, is distributed to the brain and the membranes which invelope it, and likewise to the eye. The *external carotid* divides into several branches, which are distributed to the larynx, pharynx, and other parts of the neck; and to the jaws, lips, tongue, eyes, temples, and all the external parts of the head.

Each *subclavian* is likewise divided into a great number of branches. It sends off the *vertebral artery*, which passes through the openings we see at the bottom of the transverse processes of the vertebræ of the neck, and in its course sends off many ramifications to the neighbouring parts. Some of its branches are distributed to the spinal marrow, and after a considerable inflection it enters into the cranium, and is distributed to the brain. The *subclavian* likewise sends off branches to the muscles of the neck and scapula; and the mediastinum, thymus, pericardium, diaphragm, the breasts, and the muscles of the thorax, and even of the abdomen, derive branches from the subclavian, which are distinguished by different names, alluding to the parts to which they are distributed; as the *mammary*, the *phrenic*, the *intercostal*, &c. But notwithstanding the great number of branches which have been described as arising from the subclavian, it is still a considerable artery when it reaches the *axilla*, where it drops its former name, which alludes to its passage under the clavicle, and is called the *axillary* artery; from which a variety of branches are distributed to the muscles of the breast, scapula, and arm.—But its main trunk taking the name of *brachialis*, runs along on the inside of the arm near the os humeri, till it reaches the joint of the fore-arm, and then it divides into two branches. This division however is different in different subjects; for in some it takes place higher up and in others lower down. When it happens to divide above the joint, it may be considered as a happy disposition in case of an accident by bleeding; for supposing the artery to be unfortunately punctured by the lancet, and that the hæmorrhage could only be stopped by making a ligature on the vessel, one branch would remain unhurt, through which the blood would pass uninterrupted to the fore-arm and hand. One of the two branches of the brachialis plunges down under the flexor muscles, and runs along the edge of the ulna; while the other is carried along the outer surface of the radius, and is easily felt at the wrist, where it is only covered by the common integuments. Both these branches commonly unite in the palm of the hand, and form an arterial arch from whence branches are detached to the fingers.

The *aorta*, after having given off at its curvature the carotids and subclavians which convey blood to all the upper parts of the body, descends upon the bodies of the vertebræ a little to the left, as far as the os sacrum, where it drops the name of *aorta*, and divides into two considerable branches. In this course, from its curvature to its bifurcation, it sends off several arteries in the following order: 1. One or two little arteries, first demonstrated by Ruysch as going to the bronchi, and called *arteriæ bronchiales Ruyschii*. 2. The arteriæ œsophageæ. These are commonly three or four in number. They arise from the fore-part of the aorta, and are distributed chiefly to the œsophagus. 3. The inferior intercostal arteries, which are distributed between the ribs in the same manner as the arteries of the three or four superior ribs are, which are derived from the subclavian. These arteries send off branches to the medulla spinalis. 4. The diaphragmatic or inferior phrenic arteries, which go to the diaphragm, stomach, omentum, duodenum, pancreas, spleen, liver, and gall-bladder. 5. The cœliac, which sends off the coronary-stomachic, the splenic, and the hepatic artery. 6. The superior mesenteric artery, which is distributed to the mesentery and small intestines. 7. The emulgents, which go to the kidneys. 8. The arteries, which are distributed to the glandulæ renales. 9. The spermatic. 10. The inferior mesenteric artery, which ramifies through the lower portion of the mesentery and the large intestines.—A branch of this artery which goes to the rectum is called the *internal hæmorrhoidal*. 11. The lumbar arteries, and a very small branch called the *sacra*, which are distributed to the muscles of the loins and abdomen, and to the os sacrum and medulla spinalis.

The trunk of the aorta, when it has reached the last vertebra lumborum, or the os sacrum, drops the name of *aorta*, and separates into two forked branches called the *iliacs*. Each of these soon divides into two branches; one of which is called the *internal iliac*, or *hypogastric artery*, and is distributed upon the contents of the pelvis and upon the muscles on its outer side. One branch, called *pudenda communis*, sends small ramifications to the end of the rectum under the name of *hæmorrhoidales externæ*, and is afterwards distributed upon the penis. The other branch, the external iliac, after having given off the circumflex artery of the os ilium and the epigastric, which is distributed to the recti-muscles, passes out of the abdomen under Poupart's ligament, and takes the name of *crural artery*. It descends on the inner part of the thigh close to the os femoris, sending off branches to the muscles, and then sinking deeper in the hind part of the thigh, reaches the ham, where it takes the name of *popliteal*: after this it separates into two considerable branches; one of which is called the *anterior tibial artery*; the other divides into two branches, and these arteries all go to be distributed to the leg and foot.

The blood, which is thus distributed by the aorta to all parts of the body, is brought back by the veins, which are supposed to be continued from the ultimate branches of arteries; and uniting together as they approach the heart, at length form the large trunks, the vena cava ascendens, and vena cava descendens.

All the veins which bring back the blood from the upper extremities, and from the head and breast, pass into the vena cava descendens; and those which return it from the lower parts of the body terminate in the vena cava ascendens; and these two cavas uniting together as they approach the heart, open by one common orifice into the left auricle.

It does not here seem to be necessary to follow the different divisions of the veins as we did those of the arteries; and it will be sufficient to remark, that in general every artery is accompanied by its vein, and that both are distinguished by the same name. But, like

like many other general rules, this too has its exceptions (c). The veins, for instance, which accompany the external and internal carotid, are not called the *carotid veins*, but the *external* and *internal jugular*.—In the thorax, there is a vein distinguished by a proper name, and this is the *azygos*, or *vena sine pari*. This vein, which is a pretty considerable one, runs along by the right side of the vertebræ of the back, and is chiefly destined to receive the blood from the intercostals on that side, and from the lower half of those on the left side, and to convey it into the vena cava descendens. In the abdomen we meet with a vein, which is still a more remarkable one, and this is the *vena portæ*, which performs the office both of an artery and a vein. It is formed by a re-union of all the veins which come from the stomach, intestines, omentum, pancreas, and spleen, so as to compose one great trunk, which goes to ramify through the liver; and after having deposited the bile, its ramifications unite and bring back into the vena cava, not only the blood which the vena portæ had carried into the liver, but likewise the blood from the hepatic artery. Every artery has a vein which corresponds with it; but the trunks and branches of the veins are more numerous than those of the arteries.—The reasons for this disposition are perhaps more difficult to be explained; the blood in its course through the veins is much farther removed from the source and cause of its motion, which are in the heart, than it was when in the arteries; so that its course is consequently less rapid, and enough of it could not possibly be brought back to the heart in the moment of its dilatation, to equal the quantity which is driven into the arteries from the two ventricles, at the time they contract; and the equilibrium which is so essential to the continuance of life and health would consequently be destroyed, if the capacity of the veins did not exceed that of the arteries, in the same proportion that the rapidity of the blood's motion through the arteries exceeds that of its return through the veins.

A large artery ramifying through the body, and continued to the minute branches of veins, which gradually unite together to form a large trunk, may be compared to two trees united to each other at their tops; or rather as having their ramifications so disposed that the two trunks terminate in one common point; and if we farther suppose, that both these trunks and their branches are hollow, and that a fluid is incessantly circulated through them, by entering into one of the trunks and returning through the other, we shall be enabled to conceive how the blood is circulated through the vessels of the human body.

Every trunk of an artery, before it divides, is nearly cylindrical, or of equal diameter through its whole length, and so are all its branches when examined separately. But every trunk seems to contain less blood than the many branehes do into which that trunk separates; and each of these branches probably contains less blood than the ramifications do into which it is subdivided: and it is the same with the veins; the volume of their several ramifications, when considered together, being found to exceed that of the great trunk which they form by their union.

The return of the blood through the veins to the heart, is promoted by the action of the muscles, and the pulsation of the arteries. And this return is likewise greatly assisted by the *valves* which are to be met with in the veins, and which constitute one of the great distinctions between them and the arteries. These valves, which are supposed to be formed by the inner coat of the veins, permit the blood to flow from the extremities towards the heart, but oppose its return. They are most frequent in the smaller veins. As the column of blood increases, they seem to become less necessary; and therefore in the vena cava ascendens, we meet with only one valve, which is near its origin.

The arteries are composed of several tunics. Some writers enumerate five of these tunics; but perhaps we may more properly reckon only three, viz. the *nervous*, *muscular*, and *cuticular* coats. The veins are by some anatomists described as having the same number of coats as the arteries; but as they do not seem to be irritable, we cannot with propriety suppose them to have a muscular tunic. We are aware of Dr Verschuir's * experiments to prove that the jugular and some other veins possess a certain degree of irritability; but it is certain, that his experiments, repeated by others, have produced a different result; and even he himself allows, that sometimes he was unable to distinguish any such property in the veins. Both these series of vessels are nourished by still more minute arteries and veins, which are seen creeping over their coats, and ramifying through their whole substance, and are called *vasa vasorum*; they have likewise many minute branches of nerves.

* *De Arteriarum et Venarum vi irritabili*, 4to.

The arteries are much stronger than the veins, and they seem to require this force to be enabled to resist the impetus with which the blood circulates through them, and to impel it on towards the veins.

When the heart contracts, it impels the blood into the arteries, and sensibly distends them; and these vessels again contract, as the heart becomes relaxed to receive more blood from the auricles; so that the cause of the contraction and dilatation of the arteries seems to be easy to be understood, being owing in part to their own contractile power, and in part to the action of the heart; but in the *veins*, the effects of this impulse not being so sensibly felt, and the vessels themselves having little or no contractile power, the blood seems to flow in a constant and equal stream: and this, together with its passing gradually from a small channel into a larger one, seems to be the reason why the *veins* have no pulsatory motion, except the large ones near the heart; and in these it seems to be occasioned by the motion of the diaphragm, and by the regurgitation of the blood in the *cavas*.

SECT.

(c) In the extremities, some of the deep-seated veins, and all the superficial ones, take a course different from that of the arteries.

Sect. XII. *Of the Action of the Heart, Auricles, and Arteries.*

127. The heart, at the time it contracts, drives the blood from its ventricles into the arteries; and the arteries being thus filled and distended, are naturally inclined to contract the moment the heart begins to dilate, and ceases to supply them with blood. These alternate motions of contraction and dilatation of the heart and arteries, are distinguished by the names of *systole* and *diastole*. When the heart is in a state of contraction or systole, the arteries are at that instant distended with blood, and in their diastole; and it is in this state we feel their pulsatory motion, which we call the *pulse*. When the heart dilates, and the arteries contract, the blood is impelled onwards into the veins, through which it is returned back to the heart. While the heart, however, is in its systole, the blood cannot pass from the veins into the ventricles, but is detained in the auricles, which are two reservoirs formed for this use, till the diastole, or dilatation of the heart, takes place; and then the distended auricles contract, and drive the blood into the ventricles: so that the auricles have an alternate systole and diastole as well as the heart.

Although both the ventricles of the heart contract at the same time, yet the blood passes from one to the other. In the same moment, for instance, that the left ventricle drives the blood into the aorta, the right ventricle impels it into the pulmonary artery, which is distributed through all the substance of the lungs. The blood is afterwards brought back into the left ventricle by the pulmonary vein, at the same time that the blood is returned by the cavas, into the right ventricle, from all the other parts of the body.

This seems to be the mode of action of the heart and its vessels: but the cause of this action has, like all other intricate and interesting subjects, been differently explained. It seems to depend on the stimulus made on the different parts of the heart by the blood itself, which by its quantity and heat, or other properties (D), is perhaps capable of first exciting that motion, which is afterwards continued through life, independent of the will, by a regular return of blood to the auricles, in a quantity proportioned to that which is thrown into the arteries.

The heart possesses the *vis insita*, or principle of irritability, in a much greater degree than any other muscle of the body. The pulse is quicker in young than in old subjects, because the former are *cæt. par.* more irritable than the latter. Upon the same principle we may explain, why the pulse is constantly quicker in weak than in robust persons.

Sect. XIII. *Of the Circulation.*

128. After what has been observed of the structure and action of the heart and its auricles, and likewise of the arteries and veins, there seem to be but very few arguments required to demonstrate the *circulation of the blood*, which has long since been established as a medical truth. This circulation may be defined to be a perpetual motion of the blood, in consequence of the action of the heart and arteries, which impel it through all the parts of the body, from whence it is brought back by the veins to the heart.

A very satisfactory proof of this circulation, and a proof easy to be understood, may be deduced from the different effects of pressure on an artery and a vein. If a ligature, for instance, is passed round an artery, the vessel swells considerably between the ligature and the heart; whereas if we tie up a vein, it only becomes filled between the extremity and the ligature, and this is what we every day observe in bleeding. The ligature we pass round the arm on these occasions, compresses the superficial veins; and the return of the blood through them being impeded, they become distended. When the ligature is too loose, the veins are not sufficiently compressed, and the blood continues its progress towards the heart; and, on the contrary, when it is made too tight, the arteries themselves become compressed; and the flow of the blood through them being impeded, the veins cannot be distended.

Another phænomenon, which effectually proves the circulation, is the loss of blood that every living animal sustains by opening only a single artery of a moderate size; for it continues to flow from the wounded vessel till the equilibrium is destroyed which is essential to life. This truth was not unknown to the ancients; and it seems strange that it did not lead them to a knowledge of the circulation, as it sufficiently proves, that all the other vessels must communicate with that which is opened. Galen, who lived more than 1500 years ago, drew this conclusion from it; and if we farther observe, that he describes (after Erasistratus, who flourished about 450 years before him) the several valves of the heart, and determines their disposition and uses, it will appear wonderful, that a period of near 2000 years should afterwards elapse before the true course of the blood was ascertained. This discovery, for which we are indebted to the immortal Harvey, has thrown new lights on physiology and the doctrine of diseases, and constitutes one of the most important periods of anatomical history.

Sect. XIV. *Of the Nature of the Blood.*

Blood, recently drawn from a vein into a bason, would seem to be an homogeneous fluid of a red colour (E); but when suffered to rest, it soon coagulates, and divides into two parts, which are distinguished by the names of *crassamentum* and *serum*. The crassamentum is the red coagulum, and the serum is the water in which it floats. Each of these may be again separated into two others; for the crassamentum, by being repeatedly 129.

(D) Dr Harvey long ago suggested, that the blood is possessed of a living principle; and Mr J. Hunter has lately endeavoured to revive this doctrine; in support of which he has adduced many ingenious arguments. The subject is a curious one, and deserves to be prosecuted as an inquiry which cannot but be interesting to physiologists.

(E) The blood, as it flows through the arteries, is observed to be more florid than it is in the veins; and this redness is acquired in its passage through the lungs. *Vid.* sect. vii.

repeatedly washed in warm water, gives out all its red globules, and what remains appears to be composed of the coagulable lymph (F), which is a gelatinous substance, capable of being hardened by fire till it becomes perfectly horny: and if we expose the serum to a certain degree of heat, part of it will be found to coagulate like the white of an egg, and there will remain a clear and limpid water, resembling urine both in its appearance and smell.

The serum and crassamentum differ in their proportion in different constitutions; in a strong person, the crassamentum is in a greater proportion to the serum than in a weak one;* and the same difference is found to take place in diseases (G).

* *Hewson's Experim. Enq.* Part I.

Sect. XV. *Of Nutrition.*

130. The variety of functions which we have described as being incessantly performed by the living body, and the continual circulation of the blood through it, must necessarily occasion a constant dissipation of the several parts which enter into its composition. In speaking of the insensible perspiration, we observed how much was incessantly passing off from the lungs and the surface of the skin. The discharge by urine is likewise every day considerable; and great part of the bile, saliva, &c. are excluded by stool. But the solid, as well as the fluid parts of the body, require a constant renewal of nutritious particles. They are exposed to the attrition of the fluids which are circulated through them; and the contraction and relaxation they repeat so many thousand times in every day, would necessarily occasion a dissolution of the machine, if the renewal was not proportioned to the waste.

It is easy to conceive how the chyle formed from the aliment is assimilated into the nature of blood, and repairs the loss of the fluid parts of our body; but how the solids are renewed, has never yet been satisfactorily explained. The nutritious parts of the blood are probably deposited by the arteries by exsudation through their pores into the tela cellulosa; and as the solid parts of the body are in the embryo only a kind of jelly, which gradually acquires the degree of consistence they are found to have when the body arrives at a more advanced age; and these same parts which consist of bones, cartilages, ligaments, muscles, &c. are sometimes reduced again by disease to a gelatinous state; we may, with some degree of probability, consider the coagulable lymph as the source of nutrition.

If the supply of nourishment exceeds the degree of waste, the body increases; and this happens in infancy and in youth: for at those periods, but more particularly the former one, the fluids bear a large proportion to the solids; and the fibres being soft and yielding, are proportionably more capable of extension and increase. But when the supply of nutrition only equals the waste, we neither increase nor decrease; and we find this to be the case when the body has attained its full growth or *acmê*: for the solids having then acquired a certain degree of firmness and rigidity, do not permit a farther increase of the body. But as we approach to old age, rigidity begins to be in excess, and the fluids (H) bear a much less proportion to the solids than before. The dissipation of the body is greater than the supply of nourishment; many of the smaller vessels become gradually impervious (I); and the fibres losing their moisture and their elasticity, appear flaccid and wrinkled. The lilies and the roses disappear, because the fluids by which they were produced can no longer reach the extremities of the capillary vessels of the skin. As these changes take place, the nervous power being proportionably weakened, the irritability and sensibility of the body, which were formerly so remarkable, are greatly diminished; and in advanced life, the hearing, the eye-sight, and all the other senses, become gradually impaired.

Sect. XVI. *Of the Glands and Secretions.*

The glands are commonly understood to be small, roundish, or oval bodies formed by the convolution of a great number of vessels, and destined to separate particular humours from the mass of blood.

They are usually divided into two classes; but it seems more proper to distinguish three kinds of glands, viz. the mucus, conglobate, and conglomerate.

The *mucous glands*, or follicles, as they are most commonly called, are small cylindrical tubes continued from

(F) It may not be improper to observe, that till of late the *coagulable lymph* has been confounded with the *serum* of the blood, which contains a substance that is likewise coagulable, though only when exposed to heat, or combined with certain chemical substances; whereas the other coagulates spontaneously when exposed to the air or to rest.

(G) When the blood separates into *serum* and *crassamentum*, if the latter be covered with a crust of a whitish or buff colour, it has been usually considered as a certain proof of the blood's being in a state of too great viscidity. This appearance commonly taking place in inflammatory diseases, has long served to confirm the theory which ascribes the cause of inflammation to lentor and obstructions. But from the late Mr Hewsons' experiments it appears, that when the action of the arteries is increased, the blood, instead of being more viscid, is, on the contrary, more fluid than in the ordinary state, previous to inflammation: and that in consequence of this, the coagulable lymph suffers the red globules, which are the heaviest part of the blood, to fall down to the bottom before it coagulates: so that the crassamentum is divided into two parts; one of which is found to consist of the coagulable lymph alone (in this case termed the *buff*); and the other, partly of this and partly of the red globules.

(H) As the fluids become less in proportion to the solids, their acrimony is found to increase; and this may perhaps compensate for the want of fluidity in the blood by diminishing its cohesion.

(I) In infancy, the arteries are numerous and large in respect to the veins, and the lymphatic glands are larger than at any other time of life; whereas, in old age, the capacity of the venous system exceeds that of the arteries, and the lymphatic system almost disappears.

from the ends of arteries. In fome parts of the body, as in the tonfils, for example, feveral of thefe follicles may be feen folded together in one common covering, and opening into one common finus. Thefe follicles are the veffels that fecrete and pour out mucus in the mouth, œfophagus, ftomach, inteftines, and other parts of the body.

The *conglobate glands* are peculiar to the lymphatic fyftem. Every lymphatic vein paffes through a gland of this kind in its way to the thoracic duct. They are met with in different parts of the body, particularly in the axilla, groin, and mefentery, and are either folitary or in diftinct clufters.

The *conglomerate glands* are of much greater bulk than the conglobate, and feem to be an affemblage of many fmaller glands. Of this kind are the liver, kidneys, &c. Some of them, as the pancreas, parotids, &c. have a granulated appearance. All thefe conglomerate glands are plentifully fupplied with blood-veffels; but their nerves are in general very minute, and few in number. Each little granulated portion furnifhes a fmall tube, which unites with other fimilar ducts, to form the common excretory duct of the gland.

The principal glands, and the humours they fecrete, have been already defcribed in different parts of this work; and there only remains for us to examine the general ftructure of the glands, and to explain the mechanifm of fecretion. On the firft of thefe fubjects two different fyftems have been formed; each of which has had, and ftill continue to have, its adherents. One of thefe fyftems was advanced by Malpighi, who fuppofed that an artery entering into a gland ramifies very minutely through its whole fubftance; and that its branches ultimately terminate in a veficular cavity or follicle, from whence the fecreted fluid paffes out through the excretory duct. This doctrine at firft met with few opponents; but the celebrated Ruyfch, who firft attempted minute injections with wax, afterwards difputed the exiftence of thefe follicles, and afferted, that every gland appears to be a continued feries of veffels, which after being repeatedly convoluted in their courfe through its fubftance, at length terminate in the excretory duct. Anatomifts are ftill divided between thefe two fyftems: that of Malpighi, however, feems to be the beft founded.

The mode of fecretion has been explained in a variety of ways, and they are all perfectly hypothetical. In fuch an inquiry it is natural to afk, how one gland conftantly feparates a particular humour, while another gland fecretes one of a very different nature from the blood? The bile, for inftance, is feparated by the liver, and the urine by the kidneys. Are thefe fecretions to be imputed to any particular difpofitions in the fluids, or is their caufe to be looked for in the folids?

It has been fuppofed, that every gland contains within itfelf a fermenting principle, by which it is enabled to change the nature of the blood it receives, and to endue it with a particular property. So that, according to this fyftem, the blood, as it circulates through the kidneys, becomes mixed with the fermenting principle of thofe glands, and a part of it is converted into urine; and again, in the liver, in the falival and other glands, the bile, the faliva, and other juices, are generated from a fimilar caufe. But it feems to be impoffible for any liquor to be confined in a place expofed to the circulation, without being carried away by the torrent of blood, every part of which would be equally affected; and this fyftem of fermentation has long been rejected as vague and chimerical. But as the caufe of fecretion continued to be looked for in the fluids, the former fyftem was fucceeded by another, in which recourfe was had to the analogy of the humours. It was obferved, that if paper is moiftened with water, and oil and water are afterwards poured upon it, that the water only will be permitted to pafs through it; but that, on the other hand, if the paper has been previoufly foaked in oil inftead of water, the oil only, and not the water, will be filtered through it. Thefe obfervations led to a fuppofition, that every fecretory organ is originally furnifhed with a humour analagous to that which it is afterwards deftined to feparate from the blood; and that in confequence of this difpofition, the fecretory veffels of the liver, for inftance, will only admit the bilious particles of the blood, while all the other humours will be excluded. This fyftem is an ingenious one, but the difficulties with which it abounds are unanfwerable; for oil and water are immifcible; whereas the blood, as it is circulated through the body, appears to be an homogenous fluid. Every oil will pafs through a paper moiftened only with one kind of oil; and wine, or fpirits mixed with water, will eafily be filtered through a paper previoufly foaked in water. Upon the fame principle, all our humours, though differing in their other properties, yet agreeing in that of being perfectly mifcible with each other, will all eafily pafs through the fame filtre.—But thefe are not all the objections to this fyftem. The humours which are fuppofed to be placed in the fecretory veffels for the determination of fimilar particles of the blood, muft be originally feparated without any analogous fluid; and that which happens once, may as eafily happen always. Again, it fometimes happens from a vicious difpofition, that humours are filtered through glands which are naturally not intended to afford them a paffage; and when this once has happened, it ought, according to this fyftem, to be expected always to do fo: whereas this is not the cafe; and we are, after all, naturally led to feek for the caufe of fecretion in the folids. It does not feem right to afcribe it to any particular figure of the fecretory veffels; becaufe the foft texture of thofe parts does not permit them to preferve any conftant fhape, and our fluids feem to be capable of accommodating themfelves to every kind of figure. Some have imputed it to the difference of diameter in the orifices of the different fecretory veffels. To this doctrine objections have likewife been raifed; and it has been argued, that the veffels of the liver, for inftance, would, upon this principle, afford a paffage not only to the bile, but to all the other humours of lefs confiftence with it. In reply to this objection, it has been fuppofed, that fecondary veffels exift, which originate from the firft, and permit all the humours thinner than the bile to pafs through them.

Each of thefe hypothefes is probably very remote from the truth.

EXPLANATION OF PLATE XXVIII.

This plate reprefents the Heart in fitu, all the large Arteries and Veins, with fome of the Mufcles, &c.

Muscles, &c.—Superior Extremity.—a, Maffeter. b, Complexus. C, Digaftricus. d, Os hyoides. e, Thyroid gland. f, Levator fcapulæ. g, Cucullaris. h h, The clavicles cut. i, The deltoid mufcle. k, Biceps flexor cubiti cut. l, Coraco-brachialis. m, Triceps extenfor cubiti. n, The heads of the pronator teres, flexor carpi radiales, and flexor digitorum fublimis, cut. o, The flexor carpi-ulnaris, cut at its extremity. p, Flexor digitorum profundus. q, Supinator radii longus, cut at its extremity. r, Ligamentum carpi tranfverfale. s, Extenfores carpi radiales. t, Latiffimus dorfi. u, Anterior edge of the ferratus anticus major. v v, The inferior part of the diaphragm. w w, Its anterior edge cut. x x, The kidneys. y, Tranfverfus abdominis. z, Os ilium.

Inferior Extremity.—*a*, Pfoas magnus. *b*, Iliacus internus. *c*, The flefhy origin of the tenfor vagina femoris. *d d*, The offa pubis cut from each other. *e*, Mufculus pectineus cut from its origin. *f*, Short head of the triceps abductor femoris cut. *g*, The great head of the triceps. *h*, The long head cut. *i*, Vaftus internus. *k*, Vaftus externus. *l*, Crureus. *m*, Gemellus *n*, Soleus. *o*, Tibia. *p*, Peronæus longus. *q*, Peronæus brevis. *r*, Fibula.

Heart and Blood-vessels.—A, The heart, with the coronary artery and veins. B, The right auricle of the heart. C, The aorta afcendens. D, The left fubclavian artery. E, The left carotid artery. F, The common trunk which fends off the right fubclavian and right carotid arteries. G, The carotis externa. H, Arteria facialis, which fends off the coronary arteries of the lips. I, Arteria temporalis profunda. K, Aorta defcendens. L L, The iliac arteries,—which fends off M M, The femoral or crural arteries. *N. B.* The other arteries in this figure have the fame diftribution as the veins of the fame name :—And generally, in the anatomical plates, the defcription to be found on the one fide, points out the fame parts in the other. 1, The frontal vein. 2, The facial vein. 3, Vena temporalis profunda. 4, Vena occipitalis. 5, Vena jugularis externa. 6, Vena jugularis interna, covering the arteria carotis communis. 7, The vafcular arch on the palm of the hand, which is formed by, 8, The radial artery and vein, and, 9, The ulnar artery and vein. 10 10, Cephalic vein. 11, Bafilic vein, that on the right fide cut. 12, Median vein. 13, The humeral vein, which, with the median, covers the humeral artery. 14 14, The external thoracic or mammary arteries and veins. 15. The axillary vein, covering the artery. 16 16, The fubclavian veins, which, with (6 6) the jugulars, form, 17, The vena cava fuperior. 18, The cutaneous arch of veins on the fore part of the foot. 19, The vena tibialis antica, covering the artery. 20, The vena profunda femoris, covering the artery. 21, The upper part of the vena faphena major. 22, The femoral vein. 23 23, The iliac veins. 24 24, Vena cava inferior. 25 25, The renal veins covering the arteries. 26 26, The diaphragmatic veins.

Part V. Of the BRAIN and NERVES.

Sect. I. *Of the Brain and its Integuments.*

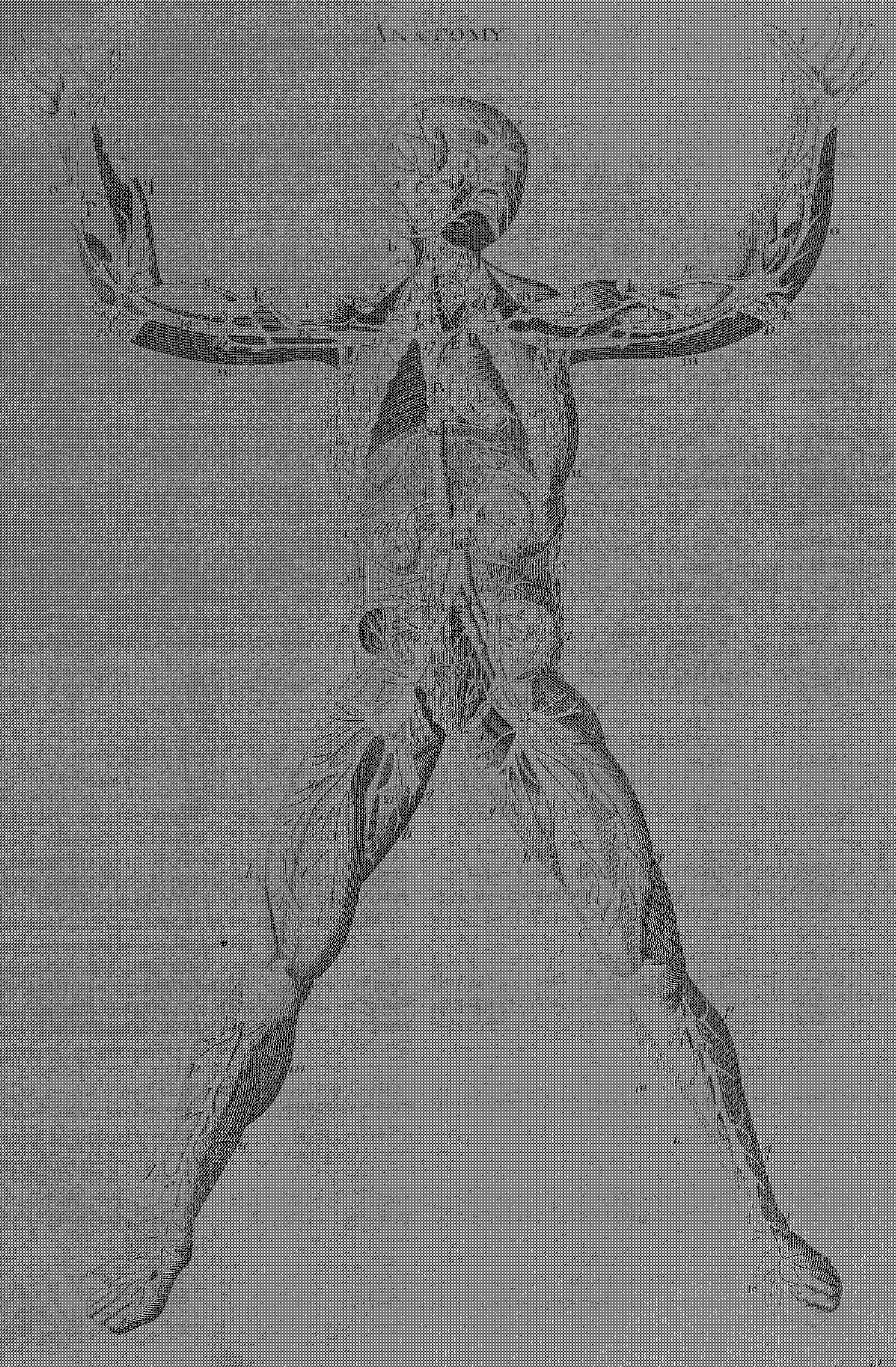
132. 133 In teguments of the brain. The bones of the cranium were defcribed in the ofteological part of this work, as inclofing the brain, and defending it from external injury : but they are not its only protection ; for when we make an horizontal fection through thefe bones, we find this mafs everywhere furrounded by two membranes (k), the dura and pia mater.—The firft of thefe lines the interior furface of the cranium, to which it everywhere adheres ftrongly (l), but more particularly at the futures, and at the many foramina through which veffels pafs between it and the pericranium. The *dura mater* (m) is perfectly fmooth and inelaftic, and its inner furface is conftantly bedewed with a fine pellucid fluid, which every where feparates it from the pia mater. The dura mater fends off feveral confiderable proceffes, which divide the brain into feparate portions, and prevent them from compreffing each other. Of thefe proceffes there is one fuperior, and longitudinal, called the *falx*, or *falciform procefs*, from its refemblance to a fcythe. It arifes from the fpine of the os frontis, near the chrifta galli, and extending along in the direction of the fagittal future, to beyond the lambdoidal future, divides the brain into two hemif-

(k) The Greeks called thefe membranes *meninges ;* but the Arabians, fuppofing them to be the fource of all the other membranes of the body, afterwards gave them the names of *dura* and *pia mater ;* by which they are now ufually diftinguifhed.

(l) In young fubjects this adhefion is greater than in adults ; but even then, in the healthy fubject, it is no where eafily feparable, without breaking through fome of the minute veffels by means of which it is attached to the bone.

(m) This membrane is commonly defcribed as confifting of two laminæ ; of which the external one is fuppofed to perform the office of periofteum internum to the cranium, while the internal one forms the folds and proceffes of the dura mater. In the natural ftate, however, no fuch feparation is apparent ; like other membranes, we may indeed divide it, not into two only, but many laminæ ; but this divifion is artificial, and depends on the dexterity of the anatomift.

ANATOMY



Jas. Ford sculpt.

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hemiſpheres. A little below the lambdoidal ſuture, it divides into two broad wings or expanſions called the *tranſverſe* or *lateral proceſſes*, which prevents the lobes of the cerebrum from preſſing on the cerebellum. Beſides theſe there is a fourth, which is ſituated under the tranſverſe proceſſes, and being continued to the ſpine of the occiput, divides the cerebellum into two lobes.

The blood, after being diſtributed through the cavity of the cranium by means of the arteries, is returned, as in the other parts of the body, by veins which all paſs on to certain channels, ſituated behind theſe ſeveral proceſſes.

Theſe canals or ſinuſes communicate with each other, and empty themſelves into the internal jugular veins, which convey the blood into the vena cava. They are in fact triangular veins, running through the ſubſtance of the dura mater, and, like the proceſſes, are diſtinguiſhed into *longitudinal* and *lateral;* and where theſe three meet, and where the fourth proceſs paſſes off, we obſerve a fourth ſinus, which is called *torcular;* Herophilus, who firſt deſcribed it, having ſuppoſed that the blood at the union of theſe two veins, is as it were, in a preſs.

Beſides theſe four canals, which were known to the ancients, modern anatomiſts enumerate many others, by giving the appellation of *ſinuſes* to other veins of the dura mater, which for the moſt part empty themſelves into ſome of thoſe we have juſt now deſcribed. There are the inferior longitudinal ſinus, the ſuperior and inferior petrous ſinuſes, the cavernous ſinuſes, the circular ſinus, and the anterior and poſterior occipital ſinuſes.

Theſe ſinuſes or veins, by being conveyed through a thick denſe membrane, firmly ſuſpended, as the dura mater is, within the cranium, are leſs liable to rupture; at the ſame time they are well ſupported, and by running every where along the inner ſurface of the bones, they are prevented from preſſing on the ſubſtance of the brain. To prevent too great a dilatation of them, we find filaments (called *chordæ Williſii*, from their having been firſt noticed by Willis) ſtretched acroſs their cavities; and the oblique manner in which the veins from the brain run through the ſubſtance of the brain into theſe channels, ſerves the purpoſe of a valve, which prevents the blood from turning back into the ſmaller and weaker veſſels of the brain.

The *pia mater* is a much ſofter and finer membrane than the dura mater; being exceedingly delicate, tranſparent, and vaſcular. It inveſts every part of the brain and ſends off an infinite number of elongations, which inſinuate themſelves between the convolutions, and even into the ſubſtance of the brain. This membrane is compoſed of two laminæ; of which the exterior one is named *tunica arachnoidea*, from its thinneſs, which is equal to that of a ſpider's web. Theſe two laminæ are intimately adherent to each other at the upper part of the brain, but are eaſily ſeparable at the baſis of the brain, and through the whole length of the medulla ſpinalis. The external layer, or tunica arachnoidea, appears to be ſpread uniformly over the ſurface of the brain, but without entering into its furrows as the inner layer does; the latter being found to inſinuate itſelf between the convolutions, and even into the interior cavities of the brain. The blood-veſſels of the brain are diſtributed through it in their way to that organ, and are therefore divided into very minute ramifications, before they penetrate the ſubſtance of the brain.

134 The brain.

There are ſeveral parts included under the general denomination of *brain*. One of theſe, which is of the ſofteſt conſiſtence, and fills the greateſt part of the cavity of the cranium, is the *cerebrum*, or *brain*, properly ſo called. Another portion, which is ſeated in the inferior and poſterior part of the head, is the *cerebellum;* and a third, which derives its origin from both theſe, is the *medulla oblongata*.

135 Cerebrum.

The *cerebrum* is a medullary maſs of a moderate conſiſtence, filling up exactly all the upper part of the cavity of the cranium, and divided into two hemiſpheres by the falx of the dura mater. Each of theſe hemiſpheres is uſually diſtinguiſhed into *an interior, a middle*, and *a poſterior lobe*. The firſt of theſe is lodged on the orbital proceſſes of the os frontis; the middle lobes lie on the middle foſſæ of the baſis of the cranium, and the poſterior lobes are placed on the tranſverſe ſeptum of the os occipitis, immediately over the cerebellum, from which they are ſeparated by the lateral proceſſes of the dura mater. Theſe two portions afford no diſtinguiſhing mark of ſeparation; and on this account Haller, and many other modern anatomiſts, omit the diſtinction of middle lobe, and ſpeak only of the anterior and poſterior lobes of the brain.

The cerebrum appears to be compoſed of two diſtinct ſubſtances. Of theſe, the exterior one, which is of a greyiſh or aſh-colour, is called the *cortex*, and is ſomewhat ſofter than the other, which is very white, and is called *medulla* or *ſubſtantia alba*.

After having removed the falx, and ſeparated the two hemiſpheres from each other, we perceive a white convex body, the corpus calloſum, which is a portion of the medullary ſubſtance, uniting the two hemiſpheres to each other, and not inveſted by the cortex. By making an horizontal inciſion in the brain, on a level with this corpus calloſum, we diſcover two oblong cavities, named the *anterior* or *lateral ventricles*, one in each hemiſphere. Theſe two ventricles, which communicate with each other by a hole immediately under the plexus choroides, are ſeparated laterally by a very fine medullary partition, called *ſeptum lucidum*, from its thinneſs and tranſparency. The lower edge of this ſeptum is fixed to the fornix, which is a kind of medullary arch (as its name implies) ſituated under the corpus calloſum, and nearly of a triangular ſhape. Anteriorly the fornix ſends off two medullary chords, called its *anterior crura;* which ſeem to be united to each other by a portion of medullary ſubſtance, named *commiſſura anterior cerebri*. Theſe crura diverging from one another, are loſt at the outer ſide of the lower and fore-part of the third ventricle. Poſteriorly the fornix is formed into two other crura, which unite with two medullary protuberances called *pedes hippocampi*, and ſometimes *cornua ammonis*, that extend along the back-part of the lateral ventricles. The concave edge of the pedes hippocampi is covered by a medullary lamina, called *corpus fimbriatum*.

Neither the edges of the fornix, nor its poſterior crura, can be well diſtinguiſhed, till we have removed the plexus choroides. This is a production of the pia mater, which is ſpread over the lateral ventricles. Its looſe

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loose edges are collected, so as to appear like a vascular band on each side.

When we have removed this plexus, we discover several other protuberances included in the lateral ventricles. These are the corpora striata, the thalami nervorum opticorum, the tubercula quadrugemina, and the pineal gland.

The *corpora striata* are two curved oblong eminences, that extend along the anterior part of the lateral ventricles. They derive their name from their striated appearance, which is owing to an intermixture of the cortical and medullary substances of the brain. The *thalami nervorum opticorum*, are so called, because the optic nerves arise chiefly from them, and they are likewise composed both of the cortex and medulla. They are separated from the corpora striata only by a kind of medullary chord, the geminum centrum semi-circulare. The thalami are nearly of an oval shape, and are situated at the bottom of the upper cavity of the lateral ventricles. They are closely united, and at their convex part seem to become one body.

Anteriorly, in the space between the thalami, we observe an orifice by which the lateral ventricles communicate, and another leads down from this, under the different appellations of *foramen commune anterius*, *vulva iter ad infundibulum*, but more properly *iter ad tertium ventriculum*; and the separation of the thalami from each other posteriorly, forms another opening or interstice called *anus*. This has been supposed to communicate with the third ventricle; but it does not, the bottom of it being shut up by the pia mater. The back part of the anus is formed by a kind of medullary band, which connects the thalami to each other, and is called *commissura posterior cerebri.*

Behind the thalami and commissura posterior, we observe a small, soft, greyish, and oval body, about the size of a pea. This is the glandula pinealis; it is described by Galen under the name of *conarion*, and has been rendered famous by Descartes, who supposed it to be the seat of the soul. Galen seems formerly to have entertained the same opinion. Some modern writers have, with as little reason, imagined that the soul is placed in the corpus callosum.

The pineal gland rests upon four remarkable eminences, disposed in pairs, and seated immediately below it. These tubercles, which by the ancients were called *testes* and *nates*, have, since the time of Winslow, been more commonly named *tubercula quadrugemina.*

Under the thalami we observe another cavity, the third ventricle, which terminates anteriorly in a small medullary canal, the infundibulum, that leads to the glandula pituitaria. It has been doubted, whether the infundibulum is really hollow; but some late experiments on this parts of the brain * by Professor Murray of Upsal, clearly prove it to be a medullary canal, surrounded by both laminæ of the pia mater. After freezing the brain, this channel was found filled with ice; and de Haen tells † us, he found it dilated, and filled with a calcareous matter (N).

* *Disp. de Infundibulo Cerebri.*

† *Ratio Med.* tom. vi. p. 271.

The soft spongy body in which the infundibulum terminates, was by the ancients supposed to be of a glandular structure, and destined to filter the serosity of the brain. Spigelius pretended to have discovered its excretory duct, but it seems certain that no such duct exists. It is of an oblong shape, composed, as it were of two lobes. In ruminant animals it is much larger than in man.

From the posterior part of the third ventricle, we see a small groove or channel, descending obliquely backwards. This channel, which is called the *aqueduct of Sylvius*, though it was known to the ancients, opens into another cavity of the brain, placed between the cerebellum and medulla oblongata, and called the *fourth ventricle*.

136 Cerebellum

The *cerebellum*, which is divided into two lobes, is commonly supposed to be of a firmer texture than the cerebrum; but the truth is, that in the greater number of subjects, there appears to be no sensible difference in the consistance of these two parts. It has more of the cortical than of the medullary substance in its composition.

The furrow that divides the two lobes of the cerebellum leads anteriorly to a process, composed of medullary and cortical substances, covered by the pia mater; and which, from its being divided into numerous furrows, resembling the rings of the earth-worm, is named *processus vermiformis*. This process forms a kind of ring in its course between the lobes.

The surface of the cerebellum does not afford those circumvolutions which appear in the cerebrum; but instead of these, we observe a great number of minute furrows, running parallel to each other, and nearly in a transverse direction. The pia mater insinuates itself into these furrows.

When we cut into the substance of the cerebellum, from above downwards, we find the medullary part running in a kind of ramifying course, and exhibiting an appearance that has got the name of *arbor vitæ*. These ramifications unite to form a medullary trunk; the middle, anterior, and most considerable part of which forms two processes, the crura cerebelli; which unite with the crura cerebri, to form the medula oblongata. The last furnishes two other processes, which lose themselves under the nates, and thus unite the lobes of the cerebellum to the posterior part of the cerebrum. Under the nates we observe a transverse medullary line, or linea alba, running from one of these processes to the other; and between them we find a very thin medullary lamina, covered with the pia mater, which the generality of anatomists have (though seemingly without reason) considered as a valve formed for closing the communication between the fourth ventricle and the aquæductus Sylvii. Vieussens named it *valvula major cerebri.*

137 Medulla oblongata.

The *medulla oblongata* is situated in the middle, lower, and posterior part of the cranium, and may be considered as a production or continuation of the whole medullary substance of the cerebrum and cerebellum, being formed by the union of two considerable medullary processes of the cerebrum, called *crura cerebri,*

(N) The under part of it, however appears to be impervious; at least no injection that can be depended on has been made to pass from it into the glandula pituitaria without laceration of parts.

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bri, with two other ſmaller ones from the cerebellum, which were juſt now ſpoken of under the name of *crura cerebelli*.

The crura cerebri ariſe from the middle and lower part of each hemiſphere. They are ſeparated from each other at their origin, but are united below, where they terminate in a middle protuberance, the *pons Varolii*, ſo called, becauſe Varolius compared it to a bridge. This name, however, can convey no idea of its real appearance. It is, in fact, nothing more than a medullary protuberance, nearly of a ſemi-ſpherical ſhape, which unites the crura cerebri to thoſe of the cerebellum.

Between the crura cerebri, and near the anterior edge of the pons Varolii, are two tubercles, compoſed externally of medullary, and internally of cineritious, ſubſtance, to which Euſtachius firſt gave the name of *eminentiæ mamillares*.

Along the middle of the poſterior ſurface of the medulla oblongata, where it forms the anterior part of the fourth ventricle, we obſerve a kind of furrow which runs downwards and terminates in a point. About an inch above the lower extremity of this fiſſure, ſeveral medullary filaments are to be ſeen running towards it on each ſide in an oblique direction, ſo as to give it the appearance of a writing-pen; hence it is called *calamus ſcriptorius*.

From the poſterior part of the pons Varolii, the medulla oblongata deſcends obliquely backwards: at its fore-part, immediately behind the pons Varolii, we obſerve two pair of eminences, which were deſcribed by Euſtachius, but received no particular appellation till the time of Vieuſſens, who gave them the names of *corpora olivaria* and *corpora pyramidalia*. The former are the outermoſt, being placed one on each ſide. They are nearly of an oval ſhape, and are compoſed of medulla, with ſtreaks of cortical ſubſtance. Between theſe are the corpora pyramidalia, each of which terminates in a point. In the human ſubject theſe four eminences are ſometimes not eaſily diſtinguiſhed.

138 Medulla ſpinalis.

The *medulla ſpinalis*, or *ſpinal marrow*, which is the name given to the medullary chord that is extended down the vertebral canal, from the great foramen of the occipital bone to the bottom of the laſt lumbar vertebra, is a continuation of the medulla oblongata. Like the other parts of the brain, it is inveſted by the dura and pia mater. The firſt of theſe, in its paſſage out of the cranium, adheres to the foramen of the os occipitis. Its connection with the ligamentary ſubſtance that lines the cavity of the ſpine, is only by means of cellular membrane; but between the ſeveral vertebræ, where the nerves paſs out of the ſpine, it ſends off prolongations, which adhere ſtrongly to the vertebral ligaments. Here, as in the cranium, the dura mater has its ſinuſes or large veins. There are two in number, and are ſeen running on each ſide of the medullary column, from the foramen magnum of the os occipitis to the lower part of the os ſacrum. They communicate together by ramifying branches at each vertebra, and terminate in the vertebral, intercoſtal, and ſacral veins.

The pia mater is connected with the dura mater by means of a thin tranſparent ſubſtance, which from its indentations between the ſpinal nerves has obtained the name of *ligamentum denticulatum*. It is ſomewhat firmer than the tunica arochnoidea, but in other reſpects reſembles that membrane. Its uſe is to ſupport the ſpinal marrow, that it may not affect the medulla oblongata by its weight.

The ſpinal marrow itſelf is externally of a white colour; but upon cutting into it we find its middle-part compoſed of a darker coloured maſs, reſembling the cortex of the brain. When the marrow has reached the firſt lumbar vertebra, it becomes extremely narrow, and at length terminates, in an oblong protuberance; from the extremity of which the pia mater ſends off a prolongation or ligament, reſembling a nerve, that perforates the dura mater, and is fixed to the os coccygis.

The medulla ſpinalis gives riſe to 30 or 31 pair of nerves, but they are not all of the ſame ſize, nor do they all run in the ſame direction. The upper ones are thinner than the reſt, and are placed almoſt tranſverſely: as we deſcend we find them running more and morely obliquely downwards, till at length their courſe is almoſt perpendicular, ſo that the lowermoſt nerves exhibit an appearance that is called *cauda equina*, from its reſemblance to a horſe's tail.

The arteries that ramify through the different parts of the brain, are derived from the internal carotid and from the vertebral arteries. The medulla ſpinalis is ſupplied by the anterior and poſterior ſpinal arteries, and likewiſe receives branches, from the cervical, the inferior and ſuperior intercoſtal, the lumbar, and the ſacral arteries.

Sect. II. *Of the Nerves.*

The nerves are medullary chords, differing from each other in ſize colour and conſiſtence and deriving their origin from the medulla oblongata and medulla ſpinalis. There are 39, and ſometimes 40, pair of theſe nerves; nine (o) of which originate from the medulla oblongata, and 30 or 31 from the medulla ſpinalis. They appear to be perfectly inelaſtic, and likewiſe to poſſeſs no irritability. If we irritate muſcular fibres, they immediately contract; but nothing of this ſort happens if we irritate a nerve. They carry with them a covering from the pia mater; but derive no tunic from the dura mater, as hath been generally, though erroneouſly, ſuppoſed, ever ſince the time of Galen (p), the 139

(o) It has been uſual to deſcribe the ten pair of nerves as ariſing from the medulla oblongata; but as the tenth pair ariſe in the ſame manner as the other ſpinal nerves, Santorini, Heiſter, Haller, and others, ſeem very properly to have claſſed them among the nerves of the ſpine.

(p) Baron Haller and Profeſſor Zinn ſeem to have been the firſt who demonſtrated, that the dura mater is reflected upon and adheres to the perioſteum at the edges of the foramina that afford a paſſage to the nerves out of the cranium, and vertebral canal, or is ſoon loſt in the cellular ſubſtance.

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the outer covering of the nerves being in fact nothing more than the cellular membrane. This covering is very thick where the nerve is exposed to the action of muscles; but where it runs through a bony canal, or is secure from pressure, the cellular tunic is extremely thin, or altogether wanting. We have instances of this in the portio mollis of the auditory nerve, and in the nerves of the heart.

By elevating, carefully and gently, the brain from the basis of the cranium, we find the first nine pair arising in the following order: 1. The nervi olfactorii, distributed through the pituitary membrane, which constitutes the organ of smell. 2. The optici, which go to the eyes, where they receive the impressions of visible objects. 3. The oculorum motores, so called because they are distributed to the muscles of the eye. 4. The pathetici, distributed to the superior oblique muscles of the eyes, the motion of which is expressive of certain passions of the soul. 5. The nerves of this pair soon divide into three principal branches, and each of these has a different name. Its upper division is the ophthalamicus, which is distributed to various parts of the eyes, eye-lids, forehead, nose, and integuments of the face. The second is called the *maxillaris superior*, and the third *maxillaris inferior*; both which names allude to their distribution. 6. The abductores; each of these nerves is distributed to the abductor muscle of the eye, so called, because it helps to draw the globe of the eye from the nose. 7. The auditorii (Q), which are distributed through the organs of hearing. 8. The par vagum, which derives its name from the great number of parts to which it gives branches both in the thorax and abdomen. 9. The linguales, or hypo-glossi, which are distributed to the tongue, and appear to contribute both to the organ of taste and to the motions of the tongue (R).

It has already been observed, that the spinal marrow sends off 30 or 31 pair of nerves; these are chiefly distributed to the exterior parts of the trunk and to the extremities. They are commonly distinguished into the *cervical*, *dorsal*, *lumbar*, and *sacral nerves*. The cervical, which pass out from between the several vertebræ of the neck, are eight (s) in number; the dorsal, twelve; the lumbar, five; and the sacral, five or six; the number of the latter depending on the number of holes in the os sacrum. Each spinal nerve at its origin is composed of two fasciculi of medullary fibres. One of these fasciculi arises from the anterior, and the other from the posterior, surface of the medulla. These fasciculi are separated by the ligamentum denticulatum, after which we find them contiguous to one another. They then perforate the dura mater, and unite to form a considerable knot or ganglion. Each of these ganglions sends off two branches; one anterior, and the other posterior. The anterior branches communicate with each other at their coming out of the spine, and likewise send off one, and sometimes more branches, to assist in the formation of the intercostal nerve.

The knots or ganglions of the nerves just now spoken of, are not only to be met with at their exit from the spine, but likewise in various parts of the body. They occur in the nerves of the medulla oblongata, as well as in those of the spine. They are not the effects of disease, but are to be met with in the same parts of the same nerves, both in the fœtus and adult. They are commonly of an oblong shape, and of a greyish colour, somewhat inclined to red, which is perhaps owing to their being extremely vascular. Internally we are able to distinguish something like an intermixture of the nervous filaments.

Some writers have considered them as so many little brains; Lancisi fancied he had discovered muscular fibres in them, but they are certainly not of an irritable nature. A late writer, Dr Johnstone*, imagines they are intended to deprive us of the power of the will over certain parts, as the heart, for instance: but if this hypothesis were well founded, we should meet with them only in the nerves leading to involuntary muscles; whereas it is certain, that the voluntary muscles receive their nerves through ganglions. Doctor Monro, from observing the accurate intermixture of the minute nerves which compose them, considers them as new sources of nervous energy†.

* *Essays on the Use of the Ganglions of the Nerves.*

† *Observations on the Nervous*

The nerves, like the blood-vessels, in their course through the body, communicate with each other; and each of these communications constitutes what is called a *plexus*, from whence branches are again detached to different parts of the body. Some of these are constant

(Q) This pair, soon after its entrance into the meatus auditorius internus, separates into two branches. One of these is of a very soft and pulpy consistence, is called the *portio mollis* of the seventh pair, and is spread over the inner part of the ear. The other passes out through the aqueduct of Fallopius in a firm chord, which is distinguished as the portio dura, and is distributed to the external ear and other parts of the neck and face.

(R) Heister has summed up the uses of these nine pair of nerves in the following Latin verses:

"*Olfaciens, cernens, oculosque movens, patiensque,*
"*Gustans, abducens, audiensque, vagansque, loquensque.*"

(s) Besides these, there is another pair called *accessorii*, which arises from the medulla spinalis at its beginning; and ascending through the great foramen of the os occipitis into the cranium, passes out again close to the eighth pair, with which, however, it does not unite; and it is afterwards distributed chiefly to the muscles of the neck, back, and scapula. In this course it sends off filaments to different parts, and likewise communicates with several other nerves. Physiologists are at a loss how to account for the singular origin and course of these nervi accessorii. The ancients considered them as branches of the eighth pair, distributed to muscles of the scapula: Willis likewise considered them as appendages to that pair, and on that account named them *accessorii*. They are sometimes called the *spinal* pair: but as this latter name is applicable to all the nerves of the spine indiscriminately, it seems better to adopt that given by Willis.

Of the Brain and Nerves.

ſtant and conſiderable enough to be diſtinguiſhed by particular names, as the *ſemilunar plexus*; the *pulmonary plexus*; the *hepatic*, the *cardiac*, &c.

It would be foreign to the purpoſe of this work, to follow the nerves through all their diſtributions; but it may be remembered, that in deſcribing the different viſcera, mention was made of the nerves diſtributed to them. There is one pair, however, called the *intercoſtal*, or *great ſympathetic nerve*, which ſeems to require particular notice, becauſe it has an almoſt univerſal connection and correſpondence with all the other nerves of the body. Authors are not perfectly agreed about the origin of the intercoſtal; but it may perhaps not improperly be deſcribed, as beginning from filaments of the fifth and ſixth pair; it then paſſes out of the cranium, through the bony canal of the carotid, from whence it deſcends laterally cloſe to the bodies of the vertebræ, and receives branches from almoſt all the vertebral nerves; forming almoſt as many ganglions in its courſe through the thorax and abdomen. It ſends off an infinite number of branches to the viſcera in thoſe cavities, and forms ſeveral plexuſes with the branches of the eighth pair or par vagum.

That the nerves are deſtined to convey the principles of motion and ſenſibility to the brain from all parts of the ſyſtem, there can be no doubt; but how theſe effects are produced, no one has ever yet been able to determine. The inquiry has been a conſtant ſource of hypotheſis in all ages, and has produced ſome ingenious ideas, and many erroneous poſitions, but without having hitherto afforded much ſatisfactory information.

Some phyſiologiſts have conſidered a trunk of nerves as a ſolid chord, capable of being divided into an infinite number of filaments, by means of which the impreſſions of feeling are conveyed to the ſenſorium commune. Others have ſuppoſed it to be a canal, which afterwards ſeparates into more minute channels; or, perhaps, as being an aſſemblage of many very ſmall and diſtinct tubes, connected to each other, and thus forming a cylindrical chord. They who contend for their being ſolid bodies, are of opinion, that feeling is occaſioned by vibration; ſo that, for inſtance, according to this ſyſtem, by pricking the finger, a vibration would be occaſioned in the nerve, diſtributed through its ſubſtance; and the effects of this vibration, when extended to the ſenſorium, would be an excital of pain. But the inelaſticity, the ſoftneſs, the connection, and the ſituation of the nerves, are ſo many proofs that vibration has no ſhare in the cauſe of feeling.

Others have ſuppoſed, that in the brain and ſpinal marrow, a very ſubtile fluid is ſecreted, and from thence conveyed through the imperceptible tubes, which they conſider as exiſting in the nerves. They have farther ſuppoſed, that this very ſubtile fluid, to which they have given the name of *animal ſpirits*, is ſecreted in the cortical ſubſtance of the brain and ſpinal marrow, from whence it paſſes through the medullary ſubſtance. This, like the other ſyſtem, is founded altogether on hypotheſis; but it ſeems to be an hypotheſis derived from much more probable principles, and there are many ingenious arguments to be brought in its ſupport.

EXPLANATION of PLATE XXIX.

FIG. 1. Repreſents the Inferior part of the Brain;—the Anterior part of the whole Spine, including the Medulla Spinalis;—with the origin and large portions of all the NERVES.

A A, The anterior lobes of the cerebrum. BB, The lateral lobes of the cerebrum. C C, The two lobes of the cerebellum. D, Tuber annulare. E, The paſſage from the third ventricle to the infundibulum. F, The medulla oblongata, which ſends off the medulla ſpinalis through the ſpine. GG, That part of the os occipitis which is placed above (H H) the tranſverſe proceſſes of the firſt cervical vertebra. I I, &c. The ſeven cervical vertebræ, with their intermediate cartilages. K K, &c. The twelve dorſal vertebræ, with their intermediate cartilages. L L, &c. The five lumbar vertebræ, with their intermediate cartilages. M, The os ſacrum. N, The os coccygis.

NERVES.—1 1, The firſt pair of nerves, named *olfactory*, which go to the noſe. 2 2, The ſecond pair, named *optic*, which goes to form the tunica retina of the eye. 3 3, The third pair, named *motor occuli*; it ſupplies moſt of the muſcles of the eye-ball. 4 4, The fourth pair, named *pathetic*,—which is wholly ſpent upon the muſculus trochlearis of the eye. 5 5, The fifth pair divides into three branches.—The firſt, named *opthalmic*, goes to the orbit, ſupplies the lachrymal gland, and ſends branches out to the forehead and noſe.—The ſecond, named *ſuperior maxillary*, ſupplies the teeth of the upper jaw, and ſome of the muſcles of the lips.—The third named *inferior maxillary*, is ſpent upon the muſcles and teeth of the lower jaw, tongue, and muſcles of the lips. 6 6, The ſixth pair, which, after ſending off the beginning of the intercoſtal or great ſympathetic, is ſpent upon the abductor oculi. 7 7, The ſeventh pair, named *auditory*, divides into two branches.—The largeſt, named *portio mollis*, is ſpent upon the internal ear. The ſmalleſt, *portio dura*, joins to the fifth pair within the internal ear by a reflected branch from the ſecond of the fifth; and within the tympanum, by a branch from the third of the fifth named *chorda tympani*.—Vid. fig. 3. near B. 8 8, &c. The eighth pair, named *par vagum*,—which accompanies the intercoſtal, and is ſpent upon the tongue, larynx, pharynx, lungs, and abdominal viſcera. 9 9, The ninth pair, which are ſpent upon the tongue. 10 10, &c. The intercoſtal, or great ſympathetic, which is ſeen from the ſixth pair to the bottom of the pelvis on each ſide of the ſpine, and joining with all the nerves of the ſpine;—in its progreſs ſupplying the heart, and, with the par vagum, the contents of the abdomen and pelvis. 11 11, The acceſſorius, which is ſpent upon the ſternocleido-maſtoidæus and trapezius muſcles. 12 12, The firſt cervical nerves;—13 13, The ſecond cervical nerves;—both ſpent upon the muſcles that lie on the neck, and teguments of the neck and head. 14 14, The third cervical nerves, which, after ſending off (15 15, &c.) the phrenic nerves to the diaphragm, ſupply

supply the muscles and teguments that lie on the side of the neck and top of the shoulder. 16 16, The brachial plexus, formed by the fourth, fifth, sixth, seventh cervicals, and first dorsal nerves; which supply the muscles and teguments of the superior extremity. 17 17, The twelve dorsal, or proper intercostal nerves, which are spent upon the intercostal muscles and some of the large muscles which lie upon the thorax. 18 18, The five lumbar pairs of nerves, which supply the lumbar and abdominal muscles, and some of the teguments and muscles of the inferior extremity. 19 19, The sacro-sciatic, or posterior crural nerve, formed by the two inferior lumbar, and three superior of the os sacrum. This large nerve supplies the greatest part of the muscles and teguments of the inferior extremity. 20, The stomachic plexus, formed by the eighth pair. 21 21, Branches of the solar or cæliac plexus, formed by the eighth pair and intercostals, which supply the stomach and chylopoietic viscera. 22 22, Branches of the superior and inferior mesenteric plexuses, formed by the eighth pair and intercostals, which supply the chylopoietic viscera, with part of the organs of urine and generation. 23 23, Nerves which accompany the spermatic cord. 24 24, The hypogastric plexus, which supplies the organs of urine and generation within the pelvis.

Fig. 2, 3, 4, 5. Show different Views of the Inferior part of the Brain, cut perpendiculary through the Middle,—with the Origin and large Portions of all the Nerves which pass out through the Bones of the Cranium,—and the three first Cervicals.

A, The anterior lobe. B, The lateral lobe of the cerebrum. C, One of the lobes of the cerebellum. D, Tuber annulare. E, Corpus pyramidale, in the middle of the medulla oblongata. F, The corpus olivare, in the side of the medulla oblongata. G, The medulla oblongata. H, The medulla spinalis.

Nerves.—1 2 3 4 5 6 7 8 and 9, Paris of nerves. 10 10, Nervus accessorius, which comes from—11, 12, and 13, The three first cervical nerves.

Part VI. Of the SENSES, and their ORGANS.

140. In treating of the senses, we mean to confine ourselves to the external ones of *touch, taste, smelling, hearing*, and *vision*. The word *sense*, when applied to these five, seems to imply not only the sensation excited in the mind by certain impressions made on the body, but likewise the organ destined to receive and transmit these impressions to the sensorium. Each of these organs being of a peculiar structure, is susceptible only of particular impressions, which will be pointed out as we proceed to describe each of them separately.

Sect. I. *Of Touch.*

141. The sense of touch may be defined to be the faculty distinguishing certain properties of bodies by the feel. In a general acceptation, this definition might perhaps not improperly be extended to every part of the body possessed of sensibility (t), but it is commonly confined to the nervous papillæ of the cutis, or true skin, which, with its appendages, and their several uses, have been already described.

The exterior properties of bodies, such as their solidity, moisture, inequality, smoothness, dryness, or fluidity, and likewise their degree of heat, seem all to be capable of making different impressions on the papillæ, and consequently of exciting different ideas in the sensorium commune. But the organ of touch, like all the other senses, is not equally delicate in every part of the body, or in every subject; being in some much more exquisite than it is in others.

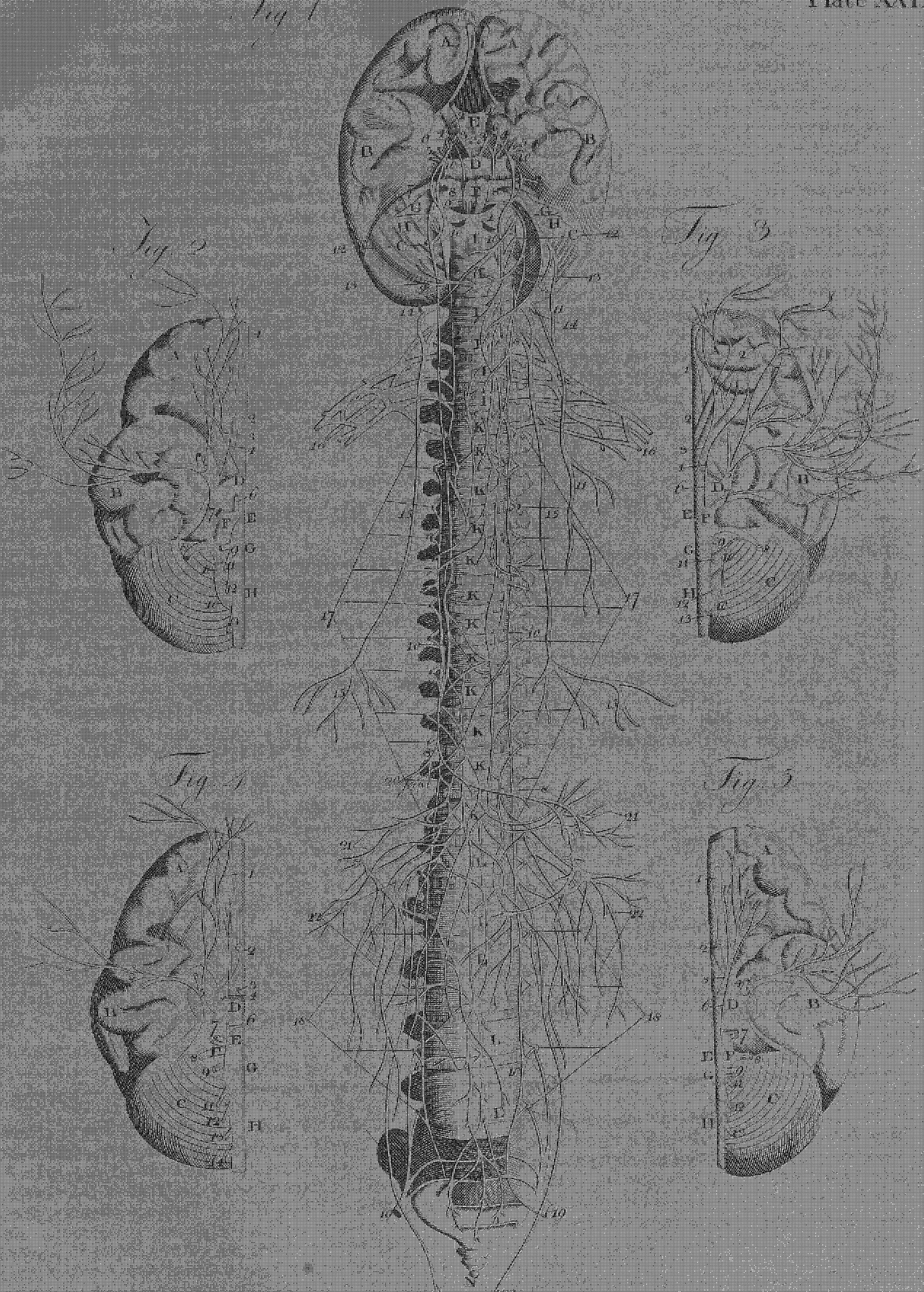
Sect. II. *Of the Taste.*

The sense of taste is seated chiefly in the tongue; 142.
the situation and figure of which are sufficiently known.

On the upper surface of this organ we may observe a great number of papillæ, which, on account of their difference in size and shape, are commonly divide into three classes. The largest are situated towards the basis of the tongue. Their number commonly varies from seven to nine, and they seem to be mucous follicles. Those of the second class are somewhat smaller, and of a cylindrical shape. They are most numerous about the middle of the tongue. Those of the third class are very minute, and of a conical shape. They are

(t) In the course of this article, mention has often been made of the sensibility or insensibility of different parts of the body: it will therefore, perhaps, not be amiss to observe in this place, that many parts which were formerly supposed to possess the most exquisite sense, are now known to have but little or no feeling, at least in a sound state; for in an inflamed state, even the bones, the most insensible parts of any, become susceptible of the most painful sensations. This curious discovery is due to the late Baron Haller. His experiments prove, that the bones, cartilages, ligaments tendons, epidermis, and membranes (as the pleura, pericardium, dura and pia mater, periosteum, &c.), may in a healthy state be considered as insensible. As sensibility depends on the brain and nerves, of course different parts will possess a greater or less degree of feeling, in proportion as they are supplied with a greater or smaller number of nerves. Upon this principle it is, that the skin, muscles, stomach, intestines, urinary bladder, ureters, uterus, vagina, penis, tongue, and retina, are extremely sensible, while the lungs and glands have only an obscure degree of feeling.

ANATOMY Plate XXIX



are very numerous on the apex and edges of the tongue, and have been ſuppoſed to be formed by the extremities of its nerves.

We obſerve a line, the *linea linguæ mediana*, running along the middle of the tongue, and dividing it as it were into two portions. Towards the baſis of the tongue, we meet with a little cavity, named by Morgagni *foramen cæcum*, which ſeems to be nothing more than a common termination of ſome of the excretory ducts of mucous glands ſituated within the ſubſtance of the tongue.

We have already obſerved, that this organ is every where covered by the cuticle, which, by forming a reduplication, called the *frænum*, at its under part, ſerves to prevent the too great motion of the tongue, and to fix it in its ſituation. But, beſides this attachment, the tongue is connected by means of its muſcles and membranous ligaments, to the lower jaw, the os hyoides, and the ſtyloid proceſſes.

The principal arteries of the tongue are the linguales, which ariſe from the external carotid. Its veins empty themſelves into the external jugulars. Its nerves ariſe from the fifth, eighth, and ninth, pair.

The variety of taſtes ſeem to be occaſioned by the different impreſſions made on the papillæ by the food. The different ſtate of the papillæ with reſpect to their moiſture, their figure, or their covering, ſeems to produce a conſiderable difference in the taſte, not only in different people, but in the ſame ſubject, in ſickneſs and in health. The great uſe of the taſte ſeems to be to enable us to diſtinguiſh wholeſome and ſalutary food from that which is unhealthy; and we obſerve that many quadrupeds, by having their papillæ (u) very large and long, have the faculty of diſtinguiſhing flavours with infinite accuracy.

Sect. III. *Of Smelling.*

143. The ſenſe of ſmelling, like the ſenſe of taſte, ſeems intended to direct us to a proper choice of aliment, and is chiefly ſeated in the noſe, which is diſtinguiſhed into its external and internal parts. The ſituation and figure of the former of theſe do not ſeem to require a definition. It is compoſed of bones and cartilages, covered by muſcular fibres and by the common integuments. The bones make up the upper portion, and the cartilages the lower one. The ſeptum narium, like the noſe, is likewiſe in part bony, and in part cartilaginous. Theſe bones and their connections were deſcribed in the oſteology.

The internal part of the noſe, beſides the oſſa ſpongioſa, has ſix cavities or ſinuſes, the maxillary, the frontal, and the ſphenoid, which were all deſcribed with the bones of the head. They all open into the noſtrils; and the noſe likewiſe communicates with the mouth, larynx, and pharynx, poſteriorly behind the velum palati.

All theſe ſeveral parts, which are included in the internal diviſion of the noſe, viz. the inner ſurface of the noſtrils, the lamellæ of the oſſa ſpongioſa, and the ſinuſes, are lined by a thick and very vaſcular membrane, which, though not unknown to the ancients, was firſt well deſcribed by Schneider*, and is therefore now commonly named *membrana pituitaria Schneideri*. This membrane is truly the organ of ſmelling; but its real ſtructure does not yet ſeem to be perfectly underſtood. It appears to be a continuation of the cuticle, which lines the inner ſurface of the mouth. In ſome parts of the noſe it is ſmooth and firm, and in others it is looſe and ſpongy. It is conſtantly moiſtened by a mucous ſecretion; the finer parts of which are carried off by the air we breathe, and the remainder, by being retained in the ſinuſes, acquires conſiderable conſiſtence. The manner in which this mucus is ſecreted has not yet been ſatisfactorily aſcertained; but it ſeems to be by means of mucous follicles.

* *De Catarrho*, lib. iii.

Its arteries are branches of the internal maxillary and internal carotid. Its veins empty themſelves into the internal jugulars. The firſt pair of nerves, the olfactory, are ſpread over every part of it, and it likewiſe receives branches from the fifth pair.

After what has been ſaid of the pituitary membrane, it will not be difficult to conceive how the air we draw in at the noſtrils, being impregnated with the effluvia of bodies, excites in us that kind of ſenſation we call *ſmelling*. As theſe effluvia, from their being exceedingly light and volatile, cannot be capable in a ſmall quantity of making any great impreſſion on the extremities of the olfactory nerves, it was neceſſary to give conſiderable extent to the pituitary membrane, that by this means a greater number of odoriferous particles might be admitted at the ſame time. When we wiſh to take in much of the effluvia of any thing, we naturally cloſe the mouth, that all the air we inſpire may paſs through the noſtrils; and at the ſame time, by means of the muſcles of the noſe, the noſtrils are dilated, and a greater quantity of air is drawn into them.

In many quadrupeds, the ſenſe of ſmelling is much more extenſive and delicate than it is in the human ſubject; and in the human ſubject it ſeems to be more perfect the leſs it is vitiated by a variety of ſmells. It is not always in the ſame ſtate of perfection, being naturally affected by every change of the pituitary membrane, and of the lymph with which that membrane is moiſtened.

Sect. IV. *Of Hearing.*

Before we undertake to explain the manner in which we are enabled to receive the impreſſions of ſound, it will be neceſſary to deſcribe the *ear*, which is the *organ of hearing*. It is commonly diſtinguiſhed into external and internal. The former of theſe diviſions includes all that we are able to diſcover without diſſection, and the meatus auditorius, as far as the tympanum; and the latter, all the other parts of the ear. 144

The *external ear* is a cartilaginous funnel, covered by the common integuments, and attached, by means of its ligaments and muſcles, to the temporal bone. Although capable only of a very obſcure motion, it is found

(u) Malpighi's deſcription of the papillæ, which has been copied by many anatomical writers, ſeems to have been taken chiefly from the tongues of ſheep.

found to have several muscles. Different parts of it are distinguished by different names; all its cartilaginous part is called *ala* or *wing*, to distinguish it from the soft and pendent part below, called the *lobe*. Its outer circle or border is called *helix*, and the semicircle within this, *antihelix*. The moveable cartilage placed immediately before the meatus auditorius, which it may be made to close exactly, is named *tragus*; and an eminence opposite to this at the extremity of the antihelix, is called *antitragus*. The concha is a considerable cavity formed by the extremities of the helix and antihelix. The meatus auditorius, which at its opening is cartilaginous, is lined with a very thin membrane, which is a continuation of the cuticle from the surface of the ear.

In this canal we find a yellow wax, which is secreted by a number of minute glands or follicles, each of which has an excretory duct. This secretion, which is at first of an oily consistence, defends the membrane of the tympanum from the injuries of the air; and by its bitterness, prevents minute insects from entering into the ear. But when from neglect or disease it accumulates in too great a quantity, it sometimes occasions deafness. The inner extremity of the meatus is closed by a very thin transparent membrane, the membrana tympani, which is set in a bony circle like the head of a drum. In the last century Rivinus, professor at Liepsic, fancied he had discovered a hole in this membrane, surrounded by a sphincter, and affording a passage to the air, between the external and internal ear. Cowper, Heister, and some other anatomists, have admitted this supposed foramen, which certainly does not exist. Whenever there is any opening in the membrana tympani, it may be considered as accidental. Under the membrana tympani runs a branch of the fifth pair of nerves, called *chorda tympani*; and beyond this membrane is the cavity of the tympanum, which is about seven or eight lines wide, and half so many in depth; it is semispherical, and every where lined by a very fine membrane. There are four openings to be observed in this cavity. It communicates with the mouth by means of the Eustachian tube. This canal, which is in part bony and in part cartilaginous, begins by a very narrow opening at the anterior and almost superior part of the tympanum, increasing in size as it advances towards the palate of the mouth, where it terminates by an oval opening. This tube is every where lined by the same membrane that covers the inside of the mouth. The real use of this canal does not seem to have been hitherto satisfactorily ascertained; but sound would seem to be conveyed through it to the membrana tympani, deaf persons being often observed to listen attentively with their mouths open. Opposite to this is a minute passage, which leads to the sinuosities of the mastoid process; and the two other openings, which are in the internal process of the os petrosum, are the fenestra ovalis, and fenestra rotunda, both of which are covered by a very fine membrane.

There are three distinct bones in the cavity of the tympanum; and these are the malleus, incus, and stapes Besides these there is a fourth, which is the *os orbiculare*, considered by some anatomists as a process of the stapes, which is necessarily broken off by the violence we are obliged to use in getting at these bones; but when accurately considered, it seems to be a distinct bone.

The *malleus* is supposed to resemble a hammer, being larger at one extremity, which is its head, than it is at the other, which is its handle. The latter is attached to the membrana tympani, and the head of the bone is articulated with the incus.

The *incus*, as it is called from its shape, though it seems to have less resemblance to an anvil than to one of the dentes molares with its roots widely separated from each other, is distinguished into its body and its legs. One of its legs is placed at the entry of the canal which leads to the mastoid process; and the other, which is somewhat longer is articulated with the stapes, or rather with the os orbiculare, which is placed between them.

The third bone is very properly named *stapes*, being perfectly shaped like a stirrup. Its basis is fixed into he fenestra ovalis, and its upper part is articulated with the os orbiculare. What is called the *fenestra rotunda*, though perhaps improperly, as it is more oval than round, is observed a little above the other, in an eminence formed by the os petrosum, and is closed by a continuation of the membrane that lines the inner surface of the tympanum. The stapes and malleus are each of them furnished with a little muscle, the stapedeus and tensor tympani. The first of these, which is the smallest in the body, arises from a little cavern in the posterior and upper part of the cavity of the tympanum; and its tendon, after passing through a hole in the same cavern, is inserted at the back part of the head of the stapes. This muscle, by drawing the stapes obliquely upwards, assists in stretching the membrana tympani.

The tensor tympani (x), or internus mallei, as it is called by some writers, arises from the cartilaginous extremity of the Eustachian tube, and is inserted into the back part of the handle of the malleus, which it serves to pull inwards, and of course helps to stretch the membrana tympani.

The labyrinth is the only part of the ear which remains to be described. It is situated in the os petrosum, and is separated from the tympanum by a partition which is every where bony, except at the two fenestræ. It is composed of three parts; and these are the vestibulum, the semicircular canals, and the cochlea.

The *vestibulum* is an irregular cavity, much smaller than the tympanum, situated nearly in the centre of the os petrosum, between the tympanum, the cochlea, and the semicircular canals. It is open on the side of the tympanum by means of the fenestra ovalis, and communicates with the upper portion of the cochlea by an oblong foramen, which is under the fenestra ovalis, from which it is separated only by a very thin partition.

Each of the three *semicircular canals* forms about half

(x) Some anatomists describe three muscles of the malleus; but only this one seems to deserve the name of muscle; what are called the *externus* and *obliquus mallei*, seeming to be ligaments rather than muscles.

half a circle of nearly a line in diameter, and running each in a different direction, they are distinguished into *vertical*, *oblique*, and *horizontal*. These three canals open by both their extremities into the vestibulum; but the vertical and the oblique being united together at one of their extremities, there are only five orifices to be seen in the vestibulum.

The *cochlea* is a canal which takes a spiral course, not unlike the shell of a snail. From its basis to its apex it makes two turns and a half; and is divided into two canals by a very thin lamina or septum, which is in part bony and in part membranous, in such a manner that these two canals only communicate with each other at the point. One of them opens into the vestibulum, and the other is covered by the membrane that closes the fenestra rotunda. The bony lamella which separates the two canals is exceedingly thin, and fills about two thirds of the diameter of the canal. The rest of the septum is composed of a most delicate membrane, which lines the whole inner surface of the cochlea, and seems to form this division in the same manner as the two membranous bags of the pleura, by being applied to each other, form the mediastinum.

Every part of the labyrinth is furnished with a very delicate periosteum, and filled with a watery fluid, secreted as in other cavities. This fluid transmits to the nerves the vibrations it receives from the membrane closing the fenestra rotunda, and from the basis of the stapes, where it rests on the fenestrum ovale. When this fluid is collected in too great a quantity, or is compressed by the stapes, it is supposed to escape through two minute canals or aqueducts, lately described by Dr Cotunni *, an ingenious physician at Naples. One of these aqueducts opens into the bottom of the vestibulum, and the other into the cochlea, near the fenestra rotunda. They both pass through the os petrosum, and communicate with the cavity of the cranium where the fluid that passes through them is is absorbed; and they are lined by a membrane which is supposed to be a production of the dura mater.

* *De aquæductibus Auris Humanæ Internæ*, 8vo, 1760.

The arteries of the external ear come from the temporal and other branches of the external carotid, and its veins pass into the jugular. The internal ear receives branches of arteries from the basilary and carotids, and its veins empty themselves into the sinuses of the dura mater, and into the internal jugular.

The portio mollis of the seventh pair is distributed through the cochlea, the vestibulum, and the semicircular canals; and the portio dura sends off a branch to the tympanum, and other branches to the external ear and parts near it.

The *sense of hearing*, in producing which all the parts we have described assist, is occasioned by a certain modulation of the air collected by the funnel-like shape of the external ear, and conveyed through the meatus auditorius to the membrana tympani. That sound is propagated by means of the air, is very easily proved by ringing a bell under the receiver of an air-pump; the sound it affords being found to diminish gradually as the air becomes exhausted, till at length it ceases to be heard at all. Sound moves through the air with infinite velocity; but the degree of its motion seems to depend on the state of the air, as it constantly moves faster in a dense and dry, than it does in a moist and rarefied air. Se *Acoustics*, nº 20.

That the air vibrating on the membrana tympani communicates its vibration to the different parts of the labyrinth, and by means of the fluid contained in this cavity affects the auditory nerve so as to produce sound, seems to be very probable; but the situation, the minuteness, and the variety of the parts which compose the ear, do not permit much to be advanced with certainty concerning their mode of action.

Some of these parts seem to constitute the immediate organ of hearing, and these are all the parts of the vestibulum: but there are others which seem intended for the perfection of this sense, without being absolutely essential to it. It has happened, for instance, that the membrana tympani, and the little bones of the ear, have been destroyed by disease, without depriving the patient of the sense of hearing (Y).

Sound is more or less loud in proportion to the strength of the vibration; and the variety of sounds seems to depend on the difference of this vibration; for the more quick and frequent it is, the more acute will be the sound, and *vice versa*.

Before we conclude this article, it will be right to explain certain phenomena, which will be found to have a relation to the organ of hearing.

Every body has, in consequence of particular sounds, occasionally felt that disagreeable sensation which is usually called *setting the teeth on edge*: and the cause of this sensation may be traced to the communication which the portio dura of the auditory nerve has with the branches of the fifth pair that are distributed to the teeth, being probably occasioned by the violent tremor produced in the membrana tympani by these very acute sounds. Upon the same principle we may explain the strong idea of sound which a person has who holds a vibrating string between his teeth.

The humming which is sometimes perceived in the ear, without any exterior cause, may be occasioned either by an increased action of the arteries in the ears, or by convulsive contractions of the muscles of the malleus and stapes, affecting the auditory nerve in such a manner as to produce the idea of sound. An ingenious philosophical writer * has lately discovered, that there are sounds liable to be excited in the ear by irritation, and without any assistance from the vibrations of the air.

* *Elliot's Philosophical Observations on the Senses of Vision and Hearing*, 8vo.

SECT. V. *Of Vision* †.

† See *Optics*, 142.

THE eyes which constitute the organ of vision, are situated in two bony cavities named *orbits*, where they are surrounded by several parts, which are either intended to protect them from external injury, or to assist in their motion.

The

(Y) This observation has led to a supposition, that a perforation of this membrane may in some cases of deafness be useful; and Mr Cheselden relates, that, some years ago, a malefactor was pardoned on condition that he should submit to this operation; but the public clamour raised against it was so great, that it was thought right not to perform it.

The globe of the eye is immediately covered by two eye-lids or palpebræ, which are composed of muscular fibres covered by the common integuments, and lined by a very fine and smooth membrane, which is from thence extended over part of the globe of the eye, and is called *tunica conjunctiva*. Each eye-lid is cartilaginous at its edge; and this border which is called *tarsus*, is furnished with a row of hairs named *cilia* or *eye-lashers*.

The cilia serve to protect the eye from insects and minute bodies floating in the air, and likewise to moderate the action of the rays of light in their passage to the retina. At the roots of these hairs there are sebaceous follicles, first noticed by Meibomius, which discharge a glutinous liniment. Sometimes the fluid they secrete has too much viscidity, and the eye-lids become glued to each other.

The upper border of the orbit is covered by the eye-brows or supercilia, which by means of their two muscles are capable of being brought towards each other, or of being carried upwards. They have been considered as serving to protect the eyes, but they are probably intended more for ornament than utility (z).

The orbits, in which the eyes are placed, are furnished with a good deal of fat, which affords a soft bed on which the eye performs its several motions. The inner angle of each orbit, or that part of it which is near the nose, is called *canthus major*, or the *great angle;* and the outer angle, which is on the opposite side of the eye, is the *canthus minor*, or *little angle*.

The little reddish body which we observe in the great angle of the eye-lids, and which is called *caruncula lachrymalis*, is supposed to be of a glandular structure, and, like the follicles of the eye-lids, to secrete an oily humour. But its structure and use do not seem to have been hitherto accurately determined. The surface of the eye is constantly moistened by a very fine limpid fluid called the *tears*, which is chiefly, and perhaps wholly, derived from a large gland of the conglomerate kind, situated in a small depression of the os frontis near the outer angle of the eye. Its excretory ducts pierce the tunica conjunctiva just above the cartilaginous borders of the upper eye-lids. When the tears were supposed to be secreted by the caruncule, this gland was called *glandula innominata;* but now that its structure and uses are ascertained, it very properly has the name of *glandula lachrymalis.* The tears poured out by the ducts of this gland are, in a natural and healty state, incessantly spread over the surface of the eye, to keep it clear and transparent, by means of the eye-lids, and as constantly pass out at the opposite corner of the eye or inner angle, through two minute orifices, the puncta lachrymalia (A); being determined into these little openings by a reduplication of the tunica conjunctiva, shaped like a crescent, the two points of which answer to the puncta. This reduplication is named *membrana*, or *valvula semilunaris.* Each of these puncta is the beginning of a small excretory tube, through which the tears pass into a little pouch or reservoir, the sacculus lachrymalis, which lies in an excavation formed partly by the nasal process of the os maxillare superius, and partly by the os unguis. The lower part of this sac forms a duct called the *ductus ad nares*, which is continued through a bony channel, and opens into the nose, through which the tears are occasionally discharged (B).

The motions of the eye are performed by six muscles; four of which are straight and two oblique. The straight muscles are distinguished by the name of *elevator, depressor, adductor*, and *abductor*, from their several uses in elevating and depressing the eye, drawing it towards the nose, or carrying it from the nose towards the temple. All these four muscles arise from the bottom of the orbit, and are inserted by flat tendons into the globe of the eye. The oblique muscles are intended for the more compound motions of the eye. The first of these muscles, the obliquus superior, does not, like the other four muscles we have described, arise from the bottom of the orbit, but from the edge of the foramen that transmits the optic nerve, which separates the origin of this muscle from that of the others. From this beginning it passes in a straight line towards a very small cartilaginous ring, the situation of which is marked in the skeleton by a little hollow in the internal orbitar process of the os frontis. The tendon of the muscle, after passing through this ring, is inserted into the upper part of the globe of the eye, which it serves to draw forwards, at the same time turning the pupil downwards.

The obliquus inferior arises from the edge of the orbit, under the opening of the ductus lachrymalis; and is inserted somewhat posteriorly into the outer side of the globe, serving to draw the eye forwards and turn the pupil upwards. When either of these two muscles acts separately, the eye is moved on its axis; but when they act together, it is compressed both above and below. The eye itself, which is now to be described, with its tunics, humours, and component parts, is nearly of a spherical figure. Of its tunics, the conjunctiva has been already described as a partial covering, reflected from the inner surface of the eye-lids over the anterior portion of the eye. What has been named *albuginea* cannot properly be considered as a coat of the eye, being in fact nothing more than the tendons of the straight muscles spread over some parts of the sclerotica.

The immediate tunics of the eye, which are to be demonstrated when its partial coverings, and all the other parts with which it is surrounded, are removed, are the sclerotica, cornea, choroides, and retina.

The *sclerotica*, which is the exterior coat, is every where

(z) It is observable, that the eye-brows are peculiar to the human species.

(A) It sometimes happens, that this very pellucid fluid, which moistens the eye, being poured out through the excretory ducts of the lachrymal gland faster than it can be carried off through the puncta, trickles down the cheek, and is then strictly and properly called *tears*.

(B) When the ductus ad nares becomes obstructed in consequence of disease, the tears are no longer able to pass into the nostrils; the sacculus lachrymalis becomes distended; and inflammation, and sometimes ulceration taking place, constitute the disease called *fistula lachrymalis*.

where white and opaque, and is joined at its anterior edge to another, which has more convexity than any other part of the globe, and being exceedingly transparent is called *cornea* (C). These two parts are perfectly different in their structure; so that some anatomists suppose them to be as distinct from each other as the glass of a watch is from the case into which it is fixed. The sclerotica is of a compact fibrous structure; the cornea, on the other hand, is composed of a great number of laminæ united by cellular membrane. By macerating them in boiling water, they do not separate from each other, as some writers have asserted; but the cornea soon softens, and becomes of a glutinous consistence.

The ancients supposed the sclerotica to be a continuation of the dura mater. Morgagni and some other modern writers are of the same opinion; but this point is disputed by Winslow, Haller, Zin, and others. The truth seems to be, that the sclerotica, though not a production of the dura mater, adheres intimately to that membrane.

The *choroides* is so called because it is furnished with a great number of vessels. It has likewise been named *uvea*, on account of its resemblance to a grape. Many modern anatomical writers have considered it as a production of the pia mater. This was likewise the opinion of the ancients; but the strength and thickness of the choroides, when compared with the delicate structure of the pia mater, are sufficient proofs of their being two distinct membranes.

The choroides has of late generally been described as consisting of two laminæ; the innermost of which has been named after Ruysch, who first described it. It is certain, however, that Ruysch's distinction is ill founded, at least with respect to the human eye, in which we are unable to demonstrate any such structure, although the tunica choroides of sheep and some other quadrupeds may easily be separated into two layers.

The choroides adheres intimately to the sclerotica round the edge of the cornea; and at the place of this union, we may observe a little whitish areola, named *ligamentum ciliare*, though it is not of a ligamentous nature.

They who suppose the choroides to be composed of two laminæ, describe the external one as terminating in the ligamentum ciliare, and the internal one as extending farther to form the iris, which is the circle we are able to distinguish through the cornea; but this part is of a very different structure from the choroides; so that some late writers have perhaps not improperly considered the iris as a distinct membrane. It derives its name from the variety of its colours, and is perforated in its middle. This perforation, which is called the *pupil* or *sight* of the eye, is closed in the fœtus by a very thin vascular membrane. This membrana pupillaris commonly disappears about the seventh month.

On the under side of the iris we observe many minute fibres, called *ciliary processes*, which pass in radii or parallel lines from the circumference to the centre. The contraction and dilatation of the pupil are supposed to depend on the action of these processes. Some have considered them as muscular, but they are not of an irritable nature: others have supposed them to be filaments of nerves: but their real structure has never yet been clearly ascertained.

Besides these ciliary processes, anatomists usually speak of the circular fibres of the iris, but no such seem to exist.

The posterior surface of the iris, the ciliary processes, and part of the tunica choroides, are covered by a black mucus for the purposes of accurate and distinct vision; but the manner in which it is secreted has not been determined.

Immediately under the tunica choroides we find the third and inner coat, called the *retina*, which seems to be merely an expansion of the pulpy substance of the optic nerve, extending to the border of the crystalline humour.

The greatest part of the globe of the eye, within these several tunics, is filled by a very transparent and gelatinous humour of considerable consistence, which, from its supposed resemblance to fused glass, is called the *vitreous humour*. It is invested by a very fine and delicate membrane, called *tunica vitrea*, and sometimes *arachnoides*.—It is supposed to be composed of two laminæ; one of which dips into its substance, and by dividing the humour into cells adds to its firmness. The fore-part of the vitreous humour is a little hollowed, to receive a very white and transparent substance of a firm texture, and of a lenticular and somewhat convex shape, named the *crystalline humour*. It is included in a capsula, which seems to be formed by a separation of the two laminæ of the tunica vitrea.

The fore-part of the eye is filled by a very thin and transparent fluid, named the *aqueous humour*, which occupies all the space between the crystalline and the prominent cornea—That part of the choroides which is called the *iris*, and which comes forward to form the pupil, appears to be suspended as it were in this humour, and has occasioned this portion of the eye to be distinguished into two parts. One of these, which is the little space between the anterior surface of the crystalline and the iris, called the *posterior chamber*; and the other, which is the space between the iris and the cornea, is called the *anterior chamber* of the eye (D). Both these spaces are completely filled with the aqueous humour. (E).

The eye receives its arteries from the internal carotid

(C) Some writers, who have given the name of *cornea* to all this outer coat, have named what is here and most commonly called *sclerotica, cornea opaca*; and its anterior and transparent portion, *cornea lucida*.

(D) We are aware that some anatomists, particularly Lieutaud, are of opinion, that the iris is every where in close contact with the crystalline, and that it is of course right to speak only of one chamber of the eye; but as this does not appear to be the case, the situation of the iris and the two chambers of the eye are here described in the usual way.

(E) When the crystalline becomes opaque, so as to prevent the passage of the rays of light to the retina, it constitutes what is called a *cataract*; and the operation of couching consists in removing the diseased crystalline from tid through the foramina optica; and its veins paſs through the foramina lacera, and empty themſelves into the lateral ſinuſes. Some of the ramifications of theſe veſſels appear on the inner ſurface of the iris, where they are ſeen to make very minute convolutions, which are ſufficiently remarkable to be diſtinguiſhed by the name of *circulus arterioſus*, though perhaps improperly, as they are chiefly branches of veins.

The optic nerve paſſes in at the poſterior part of the eye, in a conſiderable trunk, to be expanded for the purpoſes of viſion, of which it is now univerſally ſuppoſed to be the immediate ſeat. But Meſſrs Mariotte and Mery contended, that the choroides is the ſeat of this ſenſe; and the ancients ſuppoſed the cryſtalline to be ſo. Beſides the optic, the eye receives branches from the third, fourth, fifth, and ſixth pair of nerves.

The humours of the eye, together with the cornea, are calculated to refract and converge the rays of light in ſuch a manner as to form at the bottom of the eye a diſtinct image of the object we look at; and the point where theſe rays meet is called the *focus* of the eye. On the retina, as in the *camera obſcura*, the object is painted in an inverted poſition; and it is only by habit that we are enabled to judge of its true ſituation, and likewiſe of its diſtance and magnitude. To a young gentleman who was born blind, and who was couched by Mr Cheſelden, every object (as he expreſſed himſelf) ſeemed to touch his eyes as what he felt did his ſkin; and he thought no objects ſo agreeable as thoſe which were ſmooth and regular, although for ſome time he could form no judgment of their ſhape, or gueſs what it was in any of them that was pleaſing to him.

In order to paint objects diſtinctly on the retina, the cornea is required to have ſuch a degree of convexity, that the rays of light may be collected at a certain point, ſo as to terminate exactly on the retina.—If the cornea is too prominent, the rays, by diverging too ſoon, will be united before they reach the retina, as is the caſe with near-ſighted people or *myopes*; and on the contrary, if it is not ſufficiently convex, the rays will not be perfectly united when they reach the back part of the eye; and this happens to long-ſighted people or *preſbi*, being found conſtantly to take place as we approach to old age, when the eye gradually flattens (F). Theſe defects are to be ſupplied by means of glaſſes. He who has too prominent an eye, will find his viſion improved by means of a concave glaſs; and upon the ſame principles, a convex glaſs will be found uſeful to a perſon whoſe eye is naturally too flat.

EXPLANATION OF PLATE XXX.

FIGURE 1. Shows the Lachrymal Canals, after the Common Teguments and Bones have been cut away.

a; The lachrymal gland. b, The two puncta lachrymalia, from which the two lachrymal canals proceed to c, The lachrymal ſac. d, The large lachrymal duct. e, Its opening into the noſe. f, The caruncula lachrymalis. g, The eye-ball.

FIG. 2. An interior View of the Coats and Humours of the Eye.

a a a a, The tunica ſclerotica cut in four angles, and turned back. b b b b, The tunica choroides adhering to the inſide of the ſclerotica, and the ciliary veſſels are ſeen paſſing over—c c, The retina which covers the vitreous humour. d d, The ciliary proceſſes, which were continued from the choroid coat. e e, The iris. f, The pupil.

FIG. 3. Shows the Optic Nerves, and Muſcles of the Eye.

a, a, The two optic nerves before they meet. b, The two optic nerves conjoined. c, The right optic nerve. d, Muſculus attollens palpebræ ſuperioris. e, Attollens oculi. f, Abductor. g g, Obliquus ſuperior, or trochlearis. h, Adductor. i, The eye-ball.

FIG. 4. Shows the Eye-ball with its Muſcles.

a, The optic nerve. b, Muſculus trochlearis. c, Part of the os frontis, to which the trochlea or pully is fixed, through which,—d, The tendons of the trochlearis paſſes. e, Attollens oculi. f, Adductor oculi. g, Abductor oculi. h, Obliquus inferior. i, Part of the ſuperior maxillary bone to which it is fixed. k, The eye-ball.

FIG. 5. Repreſents the Nerves and Muſcles of the Right Eye, after part of the Bones of the orbit have been cut away.

A, The eye-ball. B, The lachrymal gland. C, Muſculus abductor oculi. D, Attolens. E, Levator palpebræ ſuperioris. F, Depreſſor oculi. G, Adductor. H, Obliquus ſuperior, with its pully. I, Its inſertion into the ſclerotic coat. K, Part of the obliquus inferior. L, The anterior part of the os frontis cut. M, The criſta galli of the ethmoid bone. N, The poſterior part of the ſphenoid bone. O, Tranſverſe ſpinous proceſs of the ſphenoid bone. P, The carotid artery, denuded where it paſſes through the bones. Q, The carotid artery within the cranium. R, the occular artery.

NERVES.—a a, The optic nerve. b, The third pair.—c, Its joining with a branch of the firſt branch of the fifth pair, to form l,—The lenticular ganglion, which ſends off the ciliary nerves, d. e e, The fourth pair. f, The trunk of the fifth pair. g, The firſt branch of the fifth pair, named ophthalmic.—h, The frontal branch of it. i, Its ciliary branches, along with which the naſal twig is ſent to the noſe. k, Its branch to the lachrymal gland. l, The lenticular ganglion. m, The ſecond branch of the fifth pair, named ſuperior maxillary. n, The third branch of the fifth pair, named inferior maxillary. o, The ſixth pair of

from its bed in the vitreous humour. In this operation the cornea is perforated, and the aqueous humour eſcapes out of the eye, but it is conſtantly renewed again in a very ſhort time. The manner, however, in which it is ſecreted, has not yet been determined.

(F) Upon this principle, they who in their youth are near-ſighted may expect to ſee better as they advance in life, as their eyes gradually become more flat.

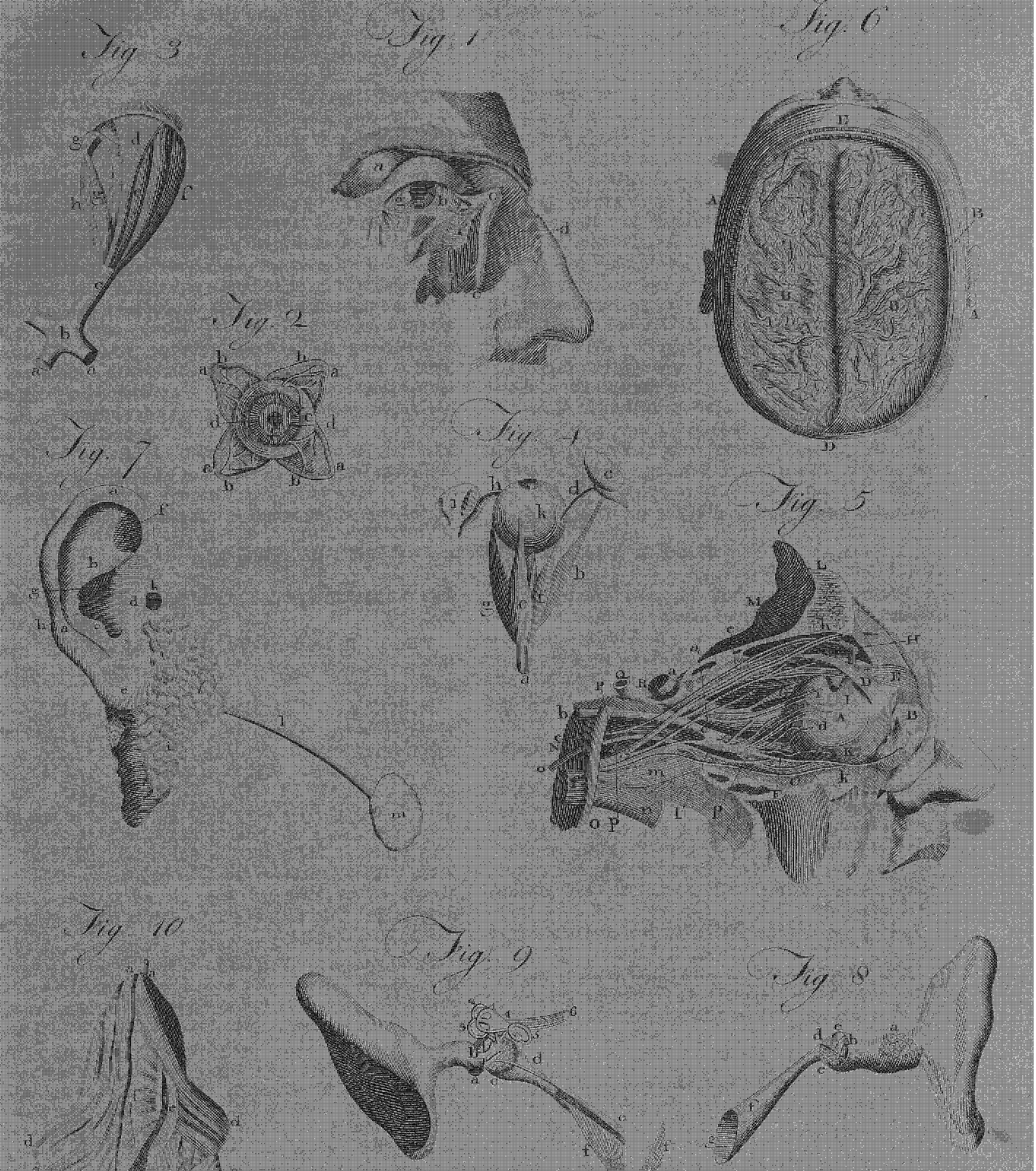


Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7
Fig. 8
Fig. 9
Fig. 10

Of the Senses.

of nerves,—which sends off p, The beginning of the great sympathetic. q, The remainder of the sixth pair, spent on c, The abductor oculi.

Fig. 6. Represents the head of a youth, where the upper part of the cranium is sawed off,—to show the upper part of the brain, covered by the pia mater, the vessels of which are minutely filled with wax.

A A, The cut edges of the upper part of the cranium. B, The two tables and intermediate diploë. B B, The two hemispheres of the cerebrum. C C, The incisure made by the falx. D, Part of the tentorium cerebello super expansum. E, part of the falx, which is fixed to the crista galli.

Fig. 7. Represents the parts of the External Ear, with the Parotid Gland and its Duct.

a a, The helix. b, The antihelix. c, The antitragus. d, The tragus. e, The lobe of the ear. f, The cavitas innominata. g, The scapha. h, The concha. i i, The parotid gland. k, A lymphatic gland, which is often found before the tragus. l, The duct of the parotic gland. m, Its opening into the mouth.

Fig. 8. A view of the posterior part of the external ear, meatus auditorius, tympanum, with its small bones, and Eustachian tube of the right side.

a, The back part of the meatus, with the small ceruminous glands. b, The incus. c, Malleus. d, The chorda tympani e, Membrana tympani. f, The Eustachian tube. g, Its mouth from the fauces.

Fig. 9. Represents the anterior part of the right external ear, the cavity of the tympanum—its small bones, cochlea, and semicircular canals.

a, The malleus. b, Incus with its long leg, resting upon the stapes. c, Membrana tympani. d, e, The Eustachian tube, covered by part of—f f, The musculus circumflexus palati. 1, 2, 3, The three semicircular canals. 4, The vestible. 5, The cochlea. 6, The portio mollis of the seventh pair of nerves.

Fig. 10. Shows the muscles which compose the fleshy substance of the Tongue.

a a, The tip of the tongue, with some of the papillæ minimæ. b, The root of the tongue. c, Part of the membrane of the tongue, which covered the epiglottis. d d, Part of the musculus hyo-glossus. e, The lingualis. f, Genio-glossus. g g, Part of the stylo-glossus.

Anaxagoras.

Anatomy of Plants. See Plants.

Anatomy of Brutes. See *Comparative Anatomy.*

ANAXAGORAS, one of the most celebrated philosophers of antiquity, was born at Clazomene in Ionia, about the 70th Olympiad. He was disciple of Anaximenes; and gave up his patrimony, to be more at leisure for the study of philosophy. He went first to Athens, and there taught eloquence; after which, having put himself under the tuition of Anaximenes, he gave lessons in philosophy in the same city. These he only gave to some particular friends and disciples, and with extreme caution. This, however, did not prevent, but rather was the cause of, his being accused of impiety, and thrown into prison, notwithstanding the credit and influence of Pericles, who was his disciple and intimate. Having been condemned to exile, he calmly yielded to the efforts of envy, and opened school at Lampsacum, where he was extremely honoured during the remainder of his life, and still more after his death, having had statues erected to his memory. He is said to have made some predictions relative to the phenomena of nature, upon which he wrote some treatises. His principal tenets may be reduced to the following:—All things were in the beginning confusedly placed together, without order and without motion. The principle of things is at the same time one and multiplex, which obtained the name of *homœmeries*, or similar particles, deprived of life. But there is besides this, from all eternity, another principle, namely, an infinite and incorporeal spirit, who gave these particles a motion; in virtue of which, such as are homogeneal united, and such as were heterogeneal separated, according to their different kinds. In this manner all things being put into motion by the spirit, and similar things being united to such as were similar, such as had a circular motion produced heavenly bodies, the lighter particles ascended, those which were heavy descended. The rocks of the earth, being drawn up by the force of the air, took fire, and became stars, beneath which the sun and moon took their stations. Thus he did not look upon the stars as divinities.

Anaxarchus ‖ Anaximenes.

ANAXARCHUS, a philosopher of Abdera, highly esteemed by Alexander the Great. His end was peculiarly tragical: having the misfortune to fall into the hands of the enemy, they pounded him alive in a mortar.

ANAXIMANDER, a famous Greek philosopher, born at Miletus in the 42d Olympiad, in the time of Polycrates tyrant of Samos. He was the first who publicly taught philosophy, and wrote upon philosophical subjects. He carried his researches into nature very far for the time in which he lived. It is said, that he discovered the obliquity of the Zodiac, was the first who published a geographical table, invented the gnomon, and set up the first sun-dial in an open place at Lacedæmon. He taught, that infinity of things was the principal and universal element; that this infinite always preserved its unity, but that its parts underwent changes; that all things came from it; and that all were about to return into it. According to all appearance, he meant by this obscure and indeterminate principle the chaos of the other philosophers. He asserted, that there are an infinity of worlds; that the stars are composed of air and fire, which are carried in their spheres, and that these spheres are gods; and that the earth is placed in the midst of the universe, as in a common centre. He added, that infinite worlds were the product of infinity, and that corruption proceeded from separation.

ANAXIMENES, born at Miletus, an eminent Greek philosopher, friend, scholar, and successor of Anaximander. He diffused some degree of light upon the obscurity of his master's system. He made the first principle of things to consist in the air, which he considered

sidered as immense or infinite, and to which he ascribed a perpetual motion. He asserted, that all things which proceeded from it were definite and circumscribed; and that this air, therefore, was God, since the divine power resigned in it and agitated it. Coldness and moisture, heat and motion, rendered it visible, and dressed it in different forms, according to the different degrees of its condensation. All the elements thus proceed from heat and cold. The earth was, in his opinion, one continued flat surface.

ANAXIMENES, the son of Aristocles of Lampsacus an orator, the disciple of Diogenes the Cynic, and of Zoilus the railer against Homer. He was preceptor to Alexander of Macedon, and followed him to the wars. Alexander being insensed against the people of Lampsacus, they sent this philosopher to intercede for them. Alexander knowing the cause of his coming, swore that he would do the very reverse of whatever he desired of him. Anaximenes begged of him to destroy Lampsacus. Alexander, unwilling to break his oath, and not able to elude this stratagem, pardoned Lampsacus much against his will.

ANAXIMANDRIANS, in the history of philosophy, the followers of Anaximander; the most ancient of the philosophical atheists, who admitted of no other substance in nature than matter.

ANAZARBUS (Pliny), ANAZARBA (Stephanus); a town of Cilicia, on the river Pyramus, the birth place of Dioscorides, and of the poet Oppian. It was sometimes called *Cæsarea*, in honour either of Augustus or of Tiberius. The inhabitants are called *Anazarbeni* (Pliny), and on coins *Anazarbies*, after the Greek idiom. It was destroyed by a dreadful earthquake in the year 525, along with several other important cities: but they were all repaired at a vast expence by the emperor Justin; who was so much affected with their misfortune, that, putting off the diadem and purple, he appeared for several days in sackcloth.

ANBERTKEND, in the eastern language, a celebrated book of the Brachmans, wherein the Indian philosophy and religion are contained. The word in its literal sense denotes the cistern wherein is the water of life. The anbertkend is divided into 50 beths, or discourses, each of which consists of ten chapters. It has been translated from the original Indian into Arabic, under the title of *Morat al Maani*, q. d. *the marrow of intelligence*.

ANCARANO, a town of Italy, in the march of Ancona, situated in E. Long. 14. 54. N. Lat. 42. 48.

ANCASTER, a town of Lincolnshire, situated in W. Long. 30′. N. Lat. 52. 30. It gives title of duke to the noble family of Bertie.

ANCENIS, a town of France, in the province of Britany. W. Long. 1. 9. N. Lat. 47. 20.

ANCESTORS, those from whom a person is descended in a straight line. The word is derived from the Latin *anceſſor*, contracted from *anteceſſor*, q. d. *goer before*.

Most nations have paid honours to their ancestors. It was properly the departed souls of their forefathers that the Romans worshipped under the denominations of *lares*, *lemures*, and *household gods*. Hence the ancient tombs were a kind of temples, or rather altars, wherein oblations were made by the kindred of the deceased.

The Russians have still their anniversary feasts in memory of their ancestors, which they call *roditoli sabot*, q. d. *kinsfolk's sabbath*, wherein they make formal visits to the dead in their graves, and carry them provisions, eatables, and presents of divers other kinds. They interrogate them, with loud lamentable cries, What they are doing? How they spend their time? What it is they want? and the like.

The Quojas, a people of Africa, offer sacrifices of rice and wine to their ancestors before ever they undertake any considerable action. The anniversaries of their deaths are always kept by their families with great solemnity. The king invokes the soul of his father and mother to make trade flourish and the chace succeed.

The Chinese seem to have distinguished themselves above all other nations in the veneration they bear their ancestors. By the laws of Confucius, part of the duty which children owe their parents consists in worshipping them when dead. This service, which makes a considerable part of the natural religion of the Chinese, is said to have been instituted by the emperor Kun, the fifth in order from the foundation of that ancient empire. Bibl. Un. tom. vii. The Chinese have both a solemn and ordinary worship which they pay their ancestors. The former is held regularly twice a-year, viz. in spring and autumn, with much pomp. A person who was present at it gives the following account of the ceremonies on that occasion: The sacrifices were made in a chapel well adorned, where there were six altars furnished with censers, tapers, and flowers. There were three ministers, and behind them two young acolites. The three former went with a profound silence, and frequent genuflexions, towards the five altars, pouring out wine: afterwards they drew near to the sixth, and when they came to the foot of the altar, half bowed down, they said their prayers with a low voice. That being finished, the three ministers went to the altar, the officiating priest took up a vessel full of wine, and drank; then he lifted up the head of a deer or goat; after which, taking fire from the altar, they all lighted a bit of paper; and the minister of the ceremonies turning towards the people, said with a high voice, that he gave them thanks in the name of their ancestors for having so well honoured them; and in recompence he promised them, on their part, a plentiful harvest, a fruitful issue, good health, and long life, and all those advantages that are most pleasing to men.

The Chinese give their ancestors another simpler and more private worship. To this end they have in their houses a niche or hollow place, where they put the names of their deceased fathers, and make prayers and offerings of perfumes and spices to them at certain times, with bowing, &c. They do the like at their tombs.

The Jews settled in China are said to worship their ancestors like the heathens, and with the same ceremonies, except that they offer not swine's flesh. Near their synnagogue they have a hall, or court of ancestors, wherein are niches for Abraham, Isaac, &c. The Jesuits also conformed, and were permitted by their general

neral to conform to this and many other superstitious customs of the Chinese.

There is one peculiarity of another kind, wherein the Chinese show their regard for their ancestors: in proportion as any of their descendants are preferred to a higher degree or dignity, their dead ancestors are at the same time preferred and ennobled with them. The kings Ven, Van, Veu, Van, and Cheu, Cum, who were descended from vassal kings, when they mounted the imperial throne, raised their ancestors from the vassal or depending state wherein these had lived, to the dignity of emperors; so that the same honours were for the future rendered them as if they had been emperors of China. The same example was followed by the subsequent kings, and now obtains among the grandees and literati; all now worship their ancestors, according to the rank which they themselves hold in the world. If the son be a mandarin and the father only a doctor, the latter is buried as a doctor, but sacrificed to as a mandarin. The like holds in degradations, where the condition of their fathers is that of their sons.

ANCHILOPS, Αγκυλη, *contraction*, and ωψ, *eye*; in medicine, denotes an abscess, or collection or matter, between the great angle of the eye and the nose. If suffered to remain too long, or unskilfully managed, it degenerates, the stagnating humours corrupt, and an ulcer is produced. When the tumor is broke, and the tears flow involuntarily, whilst the os lachrymale is not carious, it is an *ægylops*; but when the ulcer is of a long standing, deep, fetid, and the os lachrymale becomes carious, it is a *fistula*. The cure is by restriction and excision, tying it at the root on the glandula lachrymalis, and, when ready, cutting it off. See SURGERY-*Index*.

ANCHISES, in fabulous history, a Trojan prince, descended from Dardanus, and the son of Capys. Venus made love to him in the form of a beautiful nymph; and bore him Æneas, the hero of Virgil's Æneid.

ANCHOR (*anchora*, Lat. from αγκυρα, Greek), a heavy, strong, crooked instrument of iron, dropped from a ship into the bottom of the water, to retain her in a convenient station in a harbour, road, or river.

The most ancient anchors are said to have been of stone; and sometimes of wood, to which a great quantity of lead was usually fixed. In some places, baskets full of stones, and sacks filled with sand, were employed for the same use. All these were let down by cords into the sea, and by their weight stayed the course of the ship. Afterwards they were composed of iron, and furnished with teeth, which, being fastened to the bottom of the sea, preserved the vessel immoveable; whence οδοντες and *dentes* are frequently taken for anchors in the Greek and Latin poets. At first there was only one tooth, whence anchors were called ετεροστομοι: but in a short time the second was added by Eupalamus, or Anacharsis, the Scythian philosopher. The anchors with two teeth were called αμφιβολοι, or αμφιστομοι; and from ancient monuments appear to have been much the same with those used in our days, only the transverse piece of wood upon their handles (the stock) is wanting in all of them. Every ship had several anchors; one of which, surpassing all the rest in bigness and strength, was pec liarly termed ιερα or *sacra*, and was never used but in extreme danger; whence *sacram anchoram solvere*, is proverbially applied to such as are forced to their last refuge.

The anchors now made are contrived so as to sink into the ground as soon as they reach it, and to hold a great strain before they can be loosened or dislodged from their station. They are composed of shank, a stock, a ring, and two arms with their flukes. The stock, which is a long piece of timber fixed across the shank, serves to guide the flukes in a direction perpendicular to the surface of the ground; so that one of them sinks into it by its own weight as soon as it falls, and is still preserved steadily in that position by the stock, which together with the shank, lies flat on the bottom. In this situation it must necessarily sustain a great effort before it can be dragged through the earth horizontally. Indeed this can only be effected by the violence of the wind or tide, or both of them, sometimes increased by the turbulence of the sea, and acting upon the ship so as to stretch the cable to its utmost tension, which accordingly may dislodge the anchor from its bed, especially if the ground be soft and oozy, or rocky. When the anchor is thus displaced, it is said, in the sea phrase, to *come home*.

That the figure of this useful instrument may be more clearly understood, let us suppose a long massy beam of iron erected perpendicularly, *b*, at the lower end of which are two arms, *d e*, of equal thickness with the beam (usually called the *shank*), only that they taper towards the points, which are elevated above the horizontal plane at an angle of 30 degrees, or inclined to the shank at an angle of 60 degrees; on the upper part of each arm, (in this position) is a fluke or thick plate of iron, *g h*, commonly shaped like an isosceles triangle whose base reaches inwards to the middle of the arm. On the upper end of the shank is fixed the stock transversely with the flukes; the stock is a long beam of oak, *f*, in two parts, strongly bolted, and hooped together with iron rings. See also N° 2. Close above the stock is the ring *a*, to which the cable is fastened, or *bent*: the ring is curiously covered with a number of pieces of short rope, which are twisted about it so as to form a very thick texture or covering called the *puddening*, and used to preserve the cable from being freted or chafed by the iron. Plate XXXI. fig. 1. n° 1.

Every ship has, or ought to have, three principal anchors, with a cable to each, viz. the sheet, *maitresse-ancre*, (which is the *anchora sacra* of the ancients); the best bower, *second ancre*; and small bower, *ancre d' affourche*, so called from their usual situation on the ship's bows. There are besides smaller anchors, for removing a ship from place to place in a harbour or river, where there may not be room or wind for sailing; these are the stream-anchor, *ancre de toue*; the kedge and grappling, *grapine*: this last, however, is chiefly designed for boats.

Method of Making ANCHORS. The goodness of the anchor is a point of great importance. Great care is therefore to be taken, that the metal it is made of be neither too soft nor too brittle; the latter rendering it liable to break and the former to straiten.

The shank, arms, and flukes, are first forged separately; then the hole is made at one end of the shank for the ring, which being also previously forged, is put

Anchor. put into the hole of the ſhank, and the two ends ſhut together. After which the arms are ſhut to the ſhank one after the other, and the anchor is finiſhed.

Proof is made of anchors, by riſing them to a great height, and then letting them fall again on a kind of iron block placed acroſs for the purpoſe. To try whether the flukes will turn to the bottom and take hold of the ground, they place the anchor on an even ſurface, with the end of one of the flukes, and one of the ends of the ſtock reſting on the ſurface; in caſe the anchor turns, and the point of the fluke riſes upwards, the anchor is good.

In England, France, and Holland, anchors are made of forged iron; but in Spain they are ſometimes made of copper, and likewiſe in ſeveral parts of the South-Sea.

For the proportions of anchors, according to Manwaring, the ſhank is to be thrice the length of one of the flukes, and half the length of the beam. According to Aubin, the length of the anchor is to be four tenths of the greateſt breadth of the ſhip; ſo that the ſhank, *e. gr.* of an anchor in a veſſel 30 feet wide, is to be 12 feet long. When the ſhank is, for inſtance eight feet long, the two arms are to be ſeven feet long, meaſuring them according to their curvity. As to the degree of curvity given the arms, there is no rule for it; the workmen are here left to their own diſcretion.

The latter writer obſerves, that the anchor of a large heavy veſſel is ſmaller, in proportion, than that of a leſſer and lighter one. The reaſon he gives is, that though the ſea employes an equal force againſt a ſmall veſſel as againſt a great one, ſuppoſing the extent of wood upon which the water acts to be equal in both, yet the little veſſel, by reaſon of its ſuperior lightneſs, does not make ſo much reſiſtance as the greater; the defect whereof muſt be ſupplied by the weight of the anchor.

From theſe, and other hydroſtatic principles, the following table has been formed; wherein is ſhown, by means of the ſhip's breadth within, how many feet the beam or ſhank ought to be long, giving it four-tenths or two fifths of the ſhip's breadth within: by which proportion might be regulated the length of the other parts of the anchor. In this table is repreſented likewiſe the weight an anchor ought to be for a ſhip from eight feet broad to 45, increaſing by one foot's breadth; ſuppoſing that all anchors are ſimilar, or that their weights are as the cubes of the lengths of the ſhanks.

Breadth of the Veſſel. Feet.	Length of the Anchor. Feet.	Weight. Pounds.
8	$3\frac{1}{5}$	33
9	$3\frac{3}{5}$	47
10	4	64
11	$4\frac{2}{5}$	84
12	$4\frac{4}{5}$	110
13	$5\frac{1}{5}$	140
14	$5\frac{2}{5}$	175
15	6	216
16	$6\frac{2}{5}$	262
17	$6\frac{4}{5}$	314
18	$7\frac{2}{5}$	373
19	$7\frac{3}{5}$	439
20	8	512
21	$8\frac{2}{5}$	592
22	$8\frac{4}{5}$	681
23	$9\frac{1}{5}$	778
24	$9\frac{3}{5}$	884
25	10	1000
26	$10\frac{2}{5}$	1124
27	$10\frac{4}{5}$	1259
28	$11\frac{1}{5}$	1405
29	$11\frac{3}{5}$	1562
30	12	1728
31	$12\frac{2}{5}$	1906
32	$12\frac{4}{5}$	2097
33	$13\frac{1}{5}$	2300
34	$13\frac{3}{5}$	2515
35	14	2742
36	$14\frac{2}{5}$	2986
37	$14\frac{4}{5}$	3242
38	$15\frac{1}{5}$	3512
39	$15\frac{3}{5}$	3796
40	16	4096
41	$16\frac{2}{5}$	4426
42	$16\frac{4}{5}$	4742
43	$17\frac{1}{5}$	5088
44	$17\frac{3}{5}$	5451
45	18	5832

M. Bouguer, in his *Traite de Navire*, directs to take the length of the ſhank in inches, and to divide the cube of it by 1160 for the weight. The reaſon is obvious; becauſe the quotient of the cube of 201 inches, which is the length of an anchor weighing 7000 ℔. divided by the weight, is 1160; and therefore, by the rule of three, this will be a common diviſor for the cube of any length, and a ſingle operation will ſuffice.

The ſame author gives the following dimenſions of the ſeveral parts of an anchor. The two arms generally form the arch of a circle, whoſe centre is three-eighths of the ſhank from the vertex, or point where it is fixed to the ſhank; and each arm is equal to the ſame length, or the radius; ſo that the two arms together make an arch of 120 degrees: the flukes are half the length of the arms, and their breadth two-fifths of the ſaid length. With reſpect to the thickneſs, the circumference at the throat, or vertex of the ſhank, is generally made about the fifth part of its length, and the ſmall end two-thirds of the throat; the ſmall end of the arms of the flukes, three-fourths of the circumference of the ſhank at the throat. Theſe dimenſions ſhould be bigger, when the iron is of a bad quality, eſpecially if caſt iron is uſed inſtead of forged iron.

At ANCHOR, the ſituation of a ſhip which rides by her anchor in a road or haven, &c. Plate XXXI. fig. 1. N°3. repreſents the fore part of a ſhip as riding in this ſituation. See alſo BUOY-ROPE.

To fiſh the ANCHOR, to draw up the flukes upon the ſhip's ſide after it is catted. See the articles DAVIT and FISH.

To ſteer the Ship to her ANCHOR, is to ſteer the ſhip's head towards the place where the anchor lies when they are heaving the cable into the ſhip; that the cable may thereby enter the hauſe with leſs reſiſtance, and the ſhip advance towards the anchor with greater facility.

ANCHOR-

Anchor-Ground is a bottom which is neither too deep, too ſhallow, nor rocky; as in the firſt the cable bears too nearly perpendicular, and is thereby apt to jerk the anchor out of the ground; in the ſecond, the ſhip's bottom is apt to ſtrike at low water, or when the ſea runs high, by which ſhe is expoſed to the danger of ſinking; and in the third, the anchor is liable to hook the broken and pointed ends of rocks, and tear away its flukes, whilſt the cable, from the ſame cauſe, is conſtantly in danger of being cut through as it rubs on their edges.

Anchor, in architecture, is a ſort of carving, ſomewhat reſembling an anchor. It is commonly placed as part of the enrichments of the boultins of capitals of the Tuſcan, Doric, and Ionic orders, and alſo of the boultins of bed-mouldings of the Doric, Ionic, and Corinthian cornices, anchors and eggs being carved alternately through the whole building.

Anchors, in heraldry, are emblems of hope, and are taken for ſuch in a ſpiritual as well as a temporal ſenſe.

Anchorage, in law, is a duty upon ſhips for the uſe of the port or harbour where they caſt anchor.

ANCHOVY, in ichthyology, the Engliſh name of the clupea encraſicolus. See Clupea.

ANCHOVY-pear. See Grias.

ANCHUSA, Alkanet or Bugloss: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 41ſt order, *aſperifoliæ*. The *calyx* is a quinquepartite perianthium, oblong and perſiſtent: The *corolla* is monopetalous and funnel-ſhaped, the throat cloſed with ſcales: The *ſtamina* conſiſt of five ſhort filaments; the antheræ oblong and covered: The *piſtillum* has four germina, a filiform ſtylus, and obtuſe ſtigma: There is no *pericarpium*, the calyx containing the ſeeds in its boſom: The *ſeeds* are four, oblong, gibbous, and engraven at the baſe.

Species. 1. The officinalis, or greater garden-bugloſs, is a native of France and of the warmer parts of Europe, but will thrive well enough in the climate of Britain; though the roots ſeldom continue longer than two years there, unleſs they happen to grow in rubbiſh, or out of an old wall, where they will live three or four years. 2. The anguſtifolia, or perenial wild borage, grows to the height of two feet when cultivated in gardens; but in thoſe places where it grows wild is ſeldom more than a foot and an half high. The leaves of this ſort are narrow; the ſpikes of flowers come out double, and have no leaves about them; the flowers are ſmall, and of a red colour. The roots will continue two years in a poor ſoil. 3. The undulata, or Portugal bugloſs, is a biennial plant, which grows to the height of two feet, and ſends out many lateral branches. The flowers are of a bright blue colour, and grow in an imbricated ſpike. 4. The orientalis, or eaſtern bugloſs, is a native of the Levant. It is a perennial plant, with long trailing branches which lie on the ground. The flowers are yellow, and about the ſize of the common bugloſs, and there is a ſucceſſion of theſe on the ſame plants great part of the year. 5. The virginiana, or puccoon, grows naturally in the woods of North-America; and being an early plant, generally flowers before the new leaves come out on the trees; ſo that in ſome woods where it abounds, the ground ſeems entirely covered with its yellow flowers. It is a perennial plant, which ſeldom riſes a foot high in good ground, but not above half that height where the ſoil is poor. The flowers grow in looſe ſpikes upon ſmooth ſtalks. 6. The ſempervirens, or ever-green borage, is a very hardy perennial plant, with weak trailing branches. It grows naturally in ſome parts of Britain and Spain. The flowers are blue, and come out between the leaves on the ſpike, like the fourth ſort. They appear during a great part of the year. 7. The cretica, or warted bugloſs of Crete, is a low trailing annual plant, whoſe branches ſeldom extend more than ſix inches. The flowers are ſmall, of a bright blue colour, and are collected into ſmall bunches at the extremity of the branches. The plants periſh ſoon after their ſeeds are ripe. 8. The tinctoria, or true alkanet, grows naturally in the Levant, but is equally hardy with the firſt ſpecies. The flowers grow in long ſpikes, coming out *imbricatim*, like the tiles of a houſe.

Culture. All the ſpecies of anchuſa may be propagated by ſeeds; which ſhould be ſown, either in the ſpring or autumn, upon a bed of light ſandy earth; and when the plants are ſtrong enough to be removed, they muſt be planted on beds at two feet diſtance from one another, and watered, if the ſeaſon requires it, till they have taken root; after which they will require no other care than to keep them free from weeds.

Medicinal Uſes, &c. The flowers of the firſt ſpecies have obtained the name of *cordial* flowers; to which they have no other title than that they moderately cool and ſoften, without offending, the palate or ſtomach; and thus, in warm climates, or in hot diſeaſes, may in ſome meaſure refreſh the patient. The root of the tinctoria is likewiſe uſed, not as poſſeſſed of any medicinal virtue, but on account of its imparting an elegant red colour to oily ſubſtances; ſo is frequently directed as a colouring ingredient for ointments, plaſters, &c. As the colour is confined to the cortical part, the ſmall roots are to be preferred, as having proportionably more bark than the large ones. The alkanet root which grows in England is greatly inferior to what comes from France, and ſome other parts of Europe.

ANCHYLOBLEPHARON. See Ancyloblepharon.

ANCHYLOPS. See Anchilops.

ANCHYLOSIS. See Ancylosis.

ANCIENT, or Antient, a term applied to things which exiſted long ago; thus we ſay, ancient nations, ancient cuſtoms, &c. See Antiquities.

Ancient, ſometimes denotes elderly, or of long ſtanding, in oppoſition to young, or new; thus we ſay, an ancient barriſter, ancient buildings.

Ancient, in a military ſenſe, denotes either the enſign or colours.

Ancient, in ſhips of war, the ſtreamer or flag borne in the ſtern.

ANCIENT demesne, in Engliſh law, is a tenure, whereby all manors belonging to the crown in William the Conqueror's and St Edward's time were held. The numbers, names, &c. hereof were entered by the Conqueror, in a book called *Domeſday Book*, yet remaining in the Exchequer; ſo that ſuch lands as by that book appeared to have belonged to the crown at

that

that time, are called *ancient demesne*.—The tenants in ancient demesne are of two sorts; one who hold their lands frankly by charter; the other by copy of court-roll, or by the verge, at the will of the lord, according to the custom of the manor.—The advantages of this tenure are, 1. That tenants holding by charter cannot be rightfully impleaded out of their manor; and, when they are, they may abate the writ, by pleading the tenure. 2. They are free from toll for all things relating to their livelihood and husbandry; nor can be impannelled on any inquest.—These tenants held originally by plowing the king's land, plashing his hedges, and the like service, for the maintenance of his household; and it was on this account that such liberties were given them, for which they may have writs of *monstraverunt* to such as take the duties of toll, &c.—No lands are to be accounted ancient demesne, but such as are held in socage. Whether land be ancient demesne or not, shall be tried by the Book of DOMESDAY.

ANCIENTY, in some ancient statutes, is used for eldership or seniority. The elder sister can demand no more than her other sisters, beside the chief mesne, by reason of her ancienty. This word is used in the statute of Ireland, 14 Hen. III.

ANCILLON (David), a minister of the reformed church at Metz, where he was born the 17th of March 1617. He studied from the ninth or tenth year of his age in the Jesuits college, where he gave such proofs of his genius, that the heads of the society tried every means to draw him over to their religion and party; but he continued firm against their attacks. He went to Geneva in 1623; and studied divinity under Spanheim, Diodati, and Tronchin, who conceived a very great esteem for him. He left Geneva in April 1641, and offered himself to the synod of Charenton in order to take upon him the office of a minister: his abilities were greatly admired by the examiners, and the whole assembly were so highly pleased with him, that they gave him the church of Meaux, the most considerable then unprovided for. Here he acquired a vast reputation for his learning, eloquence, and virtue, and was even highly respected by those of the Roman-catholic communion. He returned to his own country in the year 1653, where he remained till the revocation of the edict of Nantes in 1685. He retired to Francfort after this fatal blow; and having preached in the French church at Hanau, the whole congregation were so edified by it, that they immediately called together the heads of the families, in order to propose that he might be invited to accept being minister there. The proposition was agreed to; and he began the exercise of his ministry in that church about the end of the year 1685. His preaching made so great a noise at Hanau, that the professors of divinity, and the German and Dutch ministers, attended his sermons frequently: the count of Hanau himself, who had never before been seen in the French church, came thither to hear Mr Ancillon: they came from the neighbouring parts, and even from Francfort; people who understood nothing of French flocked together with great eagerness, and said they loved to see him speak. This occasioned a great jealousy in the two other ministers; which tended to make his situation uneasy. He therefore went to Berlin; where he met with a kind reception from his highness the elector, and was made minister of the city. Here he had the pleasure of seeing his eldest son made judge and director of the French in the same city, and his other son rewarded with a pension and entertained at the university of Francfort upon the Oder. He had likewise the satisfaction of seeing his brother made judge of all the French in the states of Brandenburgh; and Mr Cayart, his son-in-law, engineer to his electoral highness. He enjoyed these agreeable circumstances, and several others, till his death, which happened at Berlin the 3d of Septemper, 1692, when he was 75 years of age.—Mr Ancillon having got a considerable fortune by marriage, was enabled thereby to gratify his passion for books; his library was accordingly very curious and large, and he increased it every day with all that appeared new and important in the republic of letters, so that at last it was one of the noblest collections in the hands of any private person in the kingdom. He published a book, in quarto, in which the whole dispute concerning Traditions is fully examined: he also wrote an apology for Luther, Zuinglius, Calvin, and Beza, and several other pieces.

ANCLAM, a strong town of Germany, in the circle of Upper Saxony, and duchy of Pomerania, remarkable for its excellent pastures. It is seated on the river Pene. E. Long. 14. 5. N. Lat. 54. 10.

ANCLE, or ANKLE. See ANKLE.

ANCONA (marquisate of), a province in the pope's territories in Italy. It lies between the gulph of Venice and mount Appenine, which bound it on the north; Abruzzo on the east; the duchy of Spoletto, and that of Urbino, on the west. The air is indifferent; but the soil is fruitful, particularly in hemp and flax; and there is great plenty of wax and honey. It contains several large towns, as Fermo, Loretto, Recanati, Macerata, Jesi, Tolentino, Ascoli, Osimo, St Severino, Monte Alto, Camerino, and Ripatransone, which are all archiepiscopal or episcopal sees.

ANCONA, a sea-port town of Italy, the capital of the marquisate of that name, and the see of a bishop. It was formerly the finest port in all Italy, being built by the emperor Trajan, about the year 115; but was almost ruined, and its trade lost: however, it has again begun to revive. Its harbour is the best in all the pope's dominions. The town lies round it on two hills; one of which is at the point of Cape St Syriaco, from whence there is a delightful prospect. On the other stands the citadel, which commands the town and harbour. The streets of this city are narrow and uneven; and the public and private buildings inferior to those of the other great towns in Italy. The cathedral is a low dark structure; and though the front is covered with fine marble, the architecture has neither beauty nor regularity. The church of St Dominic, and that of the Franciscans, have each an excellent picture of Titian. The exchange, where the merchants meet, is a handsome square portico, in which is an equestrian statue of Trajan, who first built the port. At the four corners are four other statues. The triumphal arch of Trajan remains almost entire, with its inscription. The common people in this town are a little particular and fantastical in their dress, but the better sort follow the French mode. It is a great thoroughfare from the north of Italy to Loretto; which renders provisions very dear.

dear. The tide does not rise here above a foot, and near the Mediterranean it is scarce visible. E. Long. 15. 5. N. Lat. 43. 36.

ANCONES, in architecture, the corners or quoins of walls, cross-beams, or rafters.—Vitruvius calls the *consoles* by the same name.

ANCONY, in the iron-works, a piece of half-wrought iron, of about three quarters of 100 weight, and of the shape of a bar in the middle, but rude and unwrought at the ends. The process for bringing the iron to this state is this: They first melt off a piece from a sow of cast iron, of the proper size; this they hammer at the forge into a mass of two feet long, and of a square shape, which they call a *bloom*; when this is done, they send it to the finery; where, after two or three heats and workings, they bring it to this figure, and call it an *ancony*. The middle part beat out at the finery, is about three feet long, and of the shape and thickness the whole is to be; this is then sent to the chafery, and there the ends are wrought to the shape of the middle, and the whole made into a bar. See Bar.

ANCORARUM urbs, Ανκυρων Πολις, a city in the Nomos Aphroditopolites, towards the Red Sea; so called because there was in the neighbourhood a stone quarry, in which they hewed stone anchors (Ptolemy,) before iron anchors came to be used. The gentilitious name is *Ancyropolites*, (Stephanus).

ANCOURT (Florent-Carton'd), an eminent French actor and dramatic writer, born at Fontainbleau, October 1661. He studied in the Jesuit's college at Paris, under father de la Rue; who, discovering in him a remarkable vivacity and capacity for learning, was extremely desirous of engaging him in their order; but Ancourt's aversion to a religious life rendered all his efforts ineffectual. After he had gone through a course of philosophy, he applied himself to the civil law, and was admitted advocate at 17 years of age. But falling in love with an actress, he was induced to go upon the stage, and he married her. As he had all the qualifications necessary for the theatre, he soon greatly distinguished himself: and not being satisfied with the applause only of an actor, he began to write pieces for the stage; many of which had such prodigious success, that most of the players grew rich from the profits of them. His merit in this way procured him a very favourable reception at court; and Lewis XIV. showed him many marks of his favour. His sprightly conversation and polite behaviour made his company agreeable to all the men of figure both at court and in the city and the most considerable persons were extremely pleased to have him at their houses. Having taken a journey to Dunkirk, to see his eldest daughter who lived there, he took the opportunity of paying his compliments to the elector of Bavaria, who was then at Brussels: this prince received him with the utmost civility; and having detained him a considerable time, dismissed him with a present of a diamond valued at 1000 pistoles; he likewise rewarded him in a very generous manner, when, upon his coming to Paris, Ancourt composed an entertainment for his diversion. Ancourt began at length to grow weary of the theatre, which he quitted in Lent 1718, and retired to his estate of Courcellesle Roy, in Berry, where he applied himself wholly to devotion, and composed a translation of David's Psalms in verse, and a sacred tragedy, which were never printed. He died the 6th of December, 1726, being 65 years of age.—The plays which he wrote are 52 in all; most of which were printed separately at the time when they were first represented; they were afterwards collected into five volumes, then into seven, and at last into nine. This last edition is the most complete.

ANCRE, a small town of France, in Picardy, with the title of a marquisate, seated on a little river of the same name. E. Long. 2. 45. N. Lat. 49. 59.

ANCUS MARTIUS, the fourth king of the Romans, succeeded by Tullius Hostilius, 639 years before Christ. He defeated the Latins, subdued the Fidenates, conquered the Sabines, Volscii, and Veientines, enlarged Rome by joining to it mount Janicula, and made the harbour of Ostia. He died about 615 years before the Christian æra.

ANCYLE, in antiquity, a kind of shield that fell, as was pretended, from heaven, in the reign of Numa Pompilius; at which time, likewise, a voice was heard declaring that Rome should be mistress of the world as long as she should preserve this holy buckler. It was kept with great care in the temple of Mars, under the direction of twelve priests; and least any should attempt to steal it, eleven others were made so like, as not to be distinguished from the sacred one. These ancylia were carried in procession every year round the city of Rome.

Ancyle, in surgery. See Ancylosis.

ANCYLOBLEPHARON, (from αγκυλος *bent* and βλεφαρον *an eye-lid*); a disease of the eye, which closes the eye-lids. Sometimes the eye-lids grow together, and also to the tunica albuginea of the eye, from carelessness when there is an ulcer in these parts. Both these cases are called *ancyloblepharon* by the Greeks. This disorder must be distinguished from that coalition of the eye-lids which happens from viscid matter gluing them together. If the cohesion is on the cornea, the sight is inevitably lost. This hath sometimes happened in the small-pox. If there is only a growing together of the eye-lids, they may be separated with the specillum, and pledgets kept between them to prevent their re-union. If the eye-lids adhere to the eye, they are to be separated by a fine-edged knife; and their re-union is to be prevented by a proper use of injections, and lint placed between them, after dipping it in some proper liniment.

ANCYLOGLOSSUM, (from αγκυλος *crooked* and γλωσσα *the tongue*); a contraction of the ligaments of the tongue. Some have this imperfection from their birth, others from some disease. In the first case, the membrane which supports the tongue is too short or too hard; in the latter, an ulcer under the tongue, healing and forming a cicatrix, is sometimes the cause; These speak with some difficulty. The ancyloglossi by nature are late before they speak: but when they begin, they soon speak properly. These we call *tongue-tied*. Mauriceau says, that in this case it is a small membranous production, which extends from the frænulum to the tip of the tongue, that hinders the child from sucking, &c. He justly condemns the cruel practice among nurses, of tearing this membrane with their nails; for thus ulcers are sometimes formed, which are of difficult cure: he advises to snip it with scissars in two or three places, taking care not to extend the points of the scissars so far as the frænulum. The instances rarely occur which require any kind of assistance; for if the child can thrust the tip of its tongue to the outer edge of its lip, this disease does not exist; and if the tongue is not greatly restrained, the frænulum will stretch by the child's sucking and crying.

ANCYLOSIS, in surgery, implies a distortion or stiffness of the joints, caused by a settlement of the humours, or a distension of the nerves, and therefore remedies of a mollifying and relaxing nature are required.

ANCYRA, the capital of Galatia, (Livy, Pliny, Ptolemy); at no great distance from the river Halys, (Livy): said to be built by Midas, king of Phrygia, and to take its name from an anchor found there, (Pausanias). It was greatly improved by Augustus, deemed the second founder of it, as appears from the *Marmor Ancyranum*. It is now called *Angura*, or *Angoura*. E. Long. 35°. Lat. 41. 20.

ANCYSTRUM, in botany: A genus of the digynia order, belonging to the diandria class of plants; the essential characters of which are: The *calyx* is a single-leaved, four-toothed perianthium, four-awned, the awns terminated with cross-barbs: The *corolla* is four-cleft; the stigma penciled.

ANDARATÆ, in antiquity, a sort of gladiators, who, mounted on horseback or in chariots, fought hoodwinked, having a helmet that covered their eyes.

ANDALUSIA, is the most western province of Spain, having Estramadura and La Mancha on the north; the kingdom of Granada, the straights of Gibraltar, and the Ocean, on the east and south; and, on the west, the kingdom of Algarva in Portugal, from which it is separated by the river Guadiana. It is about 182 miles long, and 150 broad. The chief cities and towns are Seville, the capital, Baeza, Gibraltar, Corduba, Cadiz, Medina, Sidonia, Jaen, Port St Mary, &c. It is the best, most fruitful, and the richest part of all Spain. There is a good air, a serene sky, a fertile soil, and a great extent on the sea-coast fit for commerce.

New ANDALUSIA, a division of the province of Terra Firma in South-America, whose boundaries cannot be well ascertained, as the Spaniards pretend a right to countries in which they have never established any settlements. According to the most reasonable limits, it extends in length 500 miles from north to south, and about 270 in breadth from east to west. The interior country is woody and mountainous, variegated with fine valleys that yield corn and pasturage. The produce of the country consists chiefly in dying-drugs, gums, medicinal roots, brazil wood, sugar, tobacco, and some valuable timber. To this province also belonged five valuable pearl-fisheries. The capital of New Andalusia is Comana, Cumana, or New Corduba, situated in N. Lat. 9. 55. about nine miles from the north sea. Here the Spaniards laid the foundation of a town in the year 1520. The place is strong by nature, and fortified by a castle capable of making a vigorous defence; as appeared in the year 1670, when it was assaulted by the buccanneers, who were repulsed with very great slaughter.

ANDAMAN or ANDEMAN Islands, in the East Indies, situated about 80 leagues distance from Tanasserim on the coast of Siam. They are but little known; only the East India ships sometimes touch at them, and are supplied by the natives with rice, herbs, and fruits: the inhabitants are by some represented as an harmless inoffensive race of men, and by others as cannibals. E. Long. 92. 0. N. Lat. from 10°. to 15°.

ANDANTE, in music, signifies a movement moderately slow, between *largo* and *allegro*.

ANDECAVI, (Tacitus); ANDEGAVI, (Pliny); ANDES, (Cæsar); ANDI, (Lucan): A people of Gallia Celtica, having the Turones to the East, the Namnetes to the west, the Pictones to the south, and the Aulerci Cœnomani to the north: now *Anjou*.

ANDEGAVI, or ANDEGAVUS, a town of Gallia Celtica (Pliny, Ptolemy); now *Angieres*. Called *Andecavi*, (Tacitus). W. Long. 30. Lat. 47. 30.

ANDELY, a town of Normandy in France, parted in two by a paved causeway. Here is a fountain to which pilgrims flock from all parts, to be cured of their disorders, on the feast-day of the saint to which it is dedicated. It is 20 miles S. E. of Rouen, and five N. W. of Paris. E. Long. 1. 30. N. Lat. 49. 20.

ANDENA, in old writers, denotes the swath made in mowing of hay, or as much ground as a man can stride over at once.

ANDEOL (St), a town of France, in the Vivarez, five miles S. of St Viviers, whose bishop formerly resided there. E. Long. 2. 50. N. Lat. 44. 24.

ANDERAB, the most southern city of the province of Balkh, possessed by the Usbeck Tartars. It is very rich and populous, but a place of no great strength. The neighbouring mountains yield excellent quarries of lapis lazulli, in which the Buckhars drive a great trade with Persia and India.—This city is situated at the foot of the mountains dividing the dominions of the Great Mogul and Persia from Great Buckharia. As there is no other way of crossing these mountains but by the road through this city, all travellers with goods must pay 4 per cent. On this account the Khan of Balkh maintains a good number of soldiers in the place.

ANDERNACAT, a city of Cologne, in the circle of the Lower Rhine. It is situated in a plain on the river Rhine; and is fortified with a wall, castle, and bulwarks. It has a trade in stone jugs and pitchers, which are sent to the mineral waters at Dunchstein. There are three monasteries here and several churches. E. Long. 7. 4. N. Lat 50. 27.

ANDERO (St), a sea-port town in the bay of Biscay, in Old Castile, seated on a small peninsula. It is a trading town, and contains about 700 houses, two parish-churches, and four monasteries. Here the Spaniards build and lay up some of their men of war. W. Long. 4. 30. N. Lat. 43. 20.

ANDERSON (Sir Edward), a younger son of an ancient Scotch family settled in Lincolnshire. He was some time a student of Lincoln college, Oxford; and removed from thence to the Inner Temple, where he applied himself diligently to the study of the law, and became a barrister. In the 9th of queen Elizabeth he was both lent and summer reader, and in the 16th double reader He was appointed her majesty's sergeant at law in the 19th year of her reign; and some time after, one of the justices of assize. In 1582 he was

Andreson, Andes.

was made lord chief justice of the common pleas, and in the year following was knighted. He held his office to the end of his life, died in the year 1605, and was buried at Eyworth in Bedfordshire. He was an able, but punctilious lawyer; a scourge to the Puritans; and a strenuous supporter of the established church. His works are, 1. Reports of many principal cases argued and adjudged in the time of queen Elizabeth, in the common bench. Lond. 1644, fol. 2. Resolutions and judgments on the cases and matters agitated in all the courts of Westminster, in the latter end of the reign of queen Elizabeth. Published by John Goldsborough, Esq; Lond. 1653, 4to. Besides these, there is a manuscript copy of his Readings still in being.

ANDERSON (Adam), a native of Scotland, was brother to the reverend James Anderson, D. D. editor of the *Diplomata Scotiæ* and *Royal Genealogies*, many years since minister of the Scots presbyterian church in Swallow-street, Piccadilly, and well known in those days among the people of that persuasion resident in London, by the name of Bishop Anderson, a learned but imprudent man, who lost a considerable part of his property in the fatal year 1720. He married, and had issue a son, and a daughter, who was the wife of an officer in the army.

Adam Anderson was for 40 years a clerk in the South Sea House; and at length arrived to his acmè there, being appointed chief clerk of the Stock and New Annuities, which office he retained till his death. He was appointed one of the trustees for establishing the colony of Georgia, in America; and was also one of the court of assistants of the Scots corporation in London. The time of the publication of his "Historical and Chronological Deduction of Trade and Commerce," a work replete with useful information, was about the year 1762. He was twice married; by the first wife he had issue a daughter, married to one Mr Hardy, an apothecary in the Strand, who are both dead without issue; he afterwards became the third husband of the widow of Mr Coulter, formerly a wholesale linen-draper in Cornhill, by whom he had no issue. She was, like him, tall and graceful; and her face has been thought to have some resemblance to that of the ever-living countess of Desmond, given in Mr Pennant's first Tour in Scotland. Mr Anderson died at his house in Red Lion-street, Clerkenwell, January 10, 1775. He had a good library of books, which were sold by his widow, who survived him several years, and died in 1781.

ANDES, a great chain of mountains in South America, which, running from the most northern part of Peru to the straits of Magellan, between 3 and 4000 miles, are the longest and most remarkable in the world. The Spaniards call them the *Cordillera de los Andes;* they form two ridges, the lowermost of which is overspread with woods and groves, and the uppermost covered with everlasting snow. Those who have been at the top, affirm, that the sky is always serene and bright; the air cold and piercing; and yet so thin, that they were scarce able to breathe, and the respiration was much thicker than ordinary; and this is attended with reaching and vomiting; which, however, has been considered by some as merely accidental. When they looked downwards, the country was hid by the clouds that hovered on the mountain's sides. The mountains just mentioned, which have been frequently ascended, are much inferior in height to many others in this enormous chain. The following is the account given of the mountain called *Pichincha*, by the mathematicians sent by the kings of France and Spain to make observations in relation to the figure of the earth.

Andes.

Soon after our artists arrived at Quito, they determined to continue the series of the triangles for measuring an arch of the meridian to the S. of that city; the company accordingly divided themselves into two bodies, consisting of French and Spaniards, and each retired to the part assigned them. Don George Juan and M. Godin, who were at the head of one party, went to the mountain of Pambamarca; while M. Bougeur, de la Condamine, and Don Ulloa, together with their assistants, climbed up to the highest summit of Pichincha. Both parties suffered extremely, as well from the severity of the cold as from the impetuosity of the winds, which on these heights blow with incessant violence; difficulties the more painful, as they had been little used to such sensations. Thus, in the torrid zone, nearly under the equinoctial, where it is natural to suppose they had most to fear from the heat, their greatest pain was caused by the excessiveness of the cold.

Their first scheme for shelter and lodging in these uncomfortable regions, was to pitch a field-tent for each company; but on Pichincha this could not be done from the narrowness of the summit: they were therefore obliged to be contented with a hut so small that they could hardly all creep into it. Nor will this appear strange, if the reader considers the bad disposition and smallness of the place, it being one of the loftiest crags of a rocky mountain, 100 fathoms above the highest part of the desart of Pichincha. Such was the situation of their mansion, which, like all the other adjacent parts, soon became covered with ice and snow. The ascent up this stupendous rock from the base, or the place where the mules could come, to their habitation, was so craggy as only to be climbed on foot; and to perform it cost them four hours continual labour and pain, from the violent efforts of the body, and the subtility of the air; the latter being such as to render respiration difficult.

The strange manner of living to which our artists were reduced during the time they were employed in a geometrical mensuration of some degrees of the meridian, may not perhaps prove unentertaining to the reader; and therefore the following account is given as a specimen of it. The desart of Pichincha, both with regard to the operations performed there and its inconveniences, differing very little from others, an idea may be very easily formed of the fatigues, hardships, and dangers, to which they were continually exposed during the time they were prosecuting the enterprise, with the conduct of which they had been honoured. The principal difference between the several desarts consisted in their greater or lesser distance from places where they could procure provisions; and in the inclemency of the weather, which was proportionate to the height of the mountains, and the season of the year.

They generally kept within their hut. Indeed they were obliged to do this, both on account of the intenseness

 tenseness of the cold, the violence of the wind, and their being continually involved in so thick a fog, that an object at six or eight paces was hardly discernible. When the fog cleared up, the clouds by their gravity moved nearer to the surface of the earth, and on all sides surrounded the mountains to a vast distance, representing the sea, with their rock like an island in the centre of it. When this happened they heard the horrid noises of the tempests, which then discharged themselves on Quito and the neighbouring country. They saw the lightnings issue from the clouds, and heard the thunders roll far beneath them: and whilst the lower parts were involved in tempests of thunder and rain, they enjoyed a delightful serenity; the wind was abated, the sky clear, and the enlivening rays of the sun moderated the severity of the cold. But their circumstances were very different when the clouds rose: their thickness rendered respiration difficult; the snow and hail fell continually; and the wind returned with all its violence; so that it was impossible entirely to overcome the fears of being, together with their hut, blown down the precipice, on whose edge it was built, or of being buried under it by the daily accumulations of ice and snow.

The wind was often so violent in these regions, that its velocity dazzled the sight, whilst their fears were increased from the dreadful concussions of the precipice, caused by the fall of enormous fragments of rocks. These crashes were the more alarming, as no other noises are heard in these desarts: and during the night, their rest, which they so greatly wanted, was frequently disturbed by such sudden sounds. When the weather was any thing fair with them, and the clouds gathered about some of the other mountains which had a connection with their observations, so that they could not make all the use they desired of this interval of good weather, they left their hut to exercise themselves. Sometimes they descended to some small distance; and at others amused themselves with rolling large fragments of rocks down the precipice; and these frequently required the joint strength of them all, though they often saw the same effected by the mere force of the wind. But they always took care in their excursions not to go so far out, but that on the least appearance of the clouds gathering about their cottage, which often happened very suddenly, they could regain their shelter. The door of their hut was fastened with thongs of leather, and on the inside not the smallest crevice was left unstopped; beside which, it was very compactly covered with straw: but, notwithstanding all their care, the wind penetrated through. The days were often little better than the nights; and all the light they enjoyed was that of a lamp or two, which they kept continually burning.

Though their hut was small, and crowded with inhabitants, beside the heat of the lamps; yet the intenseness of the cold was such, that every one of them was obliged to have a chafing dish of coals. These precautions would have rendered the rigour of the climate supportable, had not the imminent danger of perishing by being blown down the precipice roused them, every time it snowed, to encounter the severity of the outward air, and to sally out with shovels to free the roof of their hut from the masses of snow which were gathering on it. Nor would it, without this precaution, have been able to support the weight. They were not indeed without servants and Indians: but these were so benumbed with the cold, that it was with great difficulty they could get them out of a small tent, where they kept a continual fire. So that all our artists could obtain from them was to take their turns in this labour; and even then they went very unwillingly about it, and consequently performed it very slowly.

It may easily be conceived what this company suffered from the asperities of such a climate. Their feet were swelled; and so tender, that they could not even bear the heat: and walking was attended with extreme pain. Their hands were covered with chilblains; their lips swelled and chopped; so that every motion in speaking, or the like, drew the blood; consequently they were obliged to strict taciturnity, and little disposed to laugh, as, by causing a distension of the lips, it produced such fissures as were very painful for two or three days after.

Their common food in this inhospitable region was a little rice boiled with some flesh or fowl, procured from Quito; and, instead of fluid water, their pot was filled with ice; they had the same resource with regard to what they drank; and while they were eating, every one was obliged to keep his plate over a chafing-dish of coals, to prevent his provisions from freezing. The same was done with regard to the water. At first they imagined the drinking strong liquors would diffuse a heat through the body, and consequently render it less sensible of the painful sharpness of the cold; but, to their surprise, they felt no manner of strength in such liquors, nor were they any greater preservative against the cold than the common water.

At the same time they found it impossible to keep the Indians together. On their first feeling of the climate, their thoughts were immediately turned on deserting their masters. The first instance they had of this kind was so unexpected, that, had not one, of a better disposition than the rest, staid and acquainted them of their design, it might have proved of very bad consequence. The affair was this: There being on the top of the rock no room for pitching a tent for the Indians, they used every evening to retire to a cave at the foot of the mountain; where, beside a natural diminution of the cold, they could keep a continual fire; and, consequently enjoyed more comfortable quarters than their masters. Before they withdrew at night, they fastened, on the outside, the door of the hut, which was so low that it was impossible to go in or out without stooping; and as every night the hail and snow which had fallen formed a wall against the door, it was the business of one or two of the Indians to come early and remove this obstruction. For though the negro servants were lodged in a little tent, their hands and feet were so covered with chilblains, that they would rather have suffered themselves to have been killed than move. The Indians therefore came constantly up to dispatch this work betwixt nine and ten in the morning: but they had not been there above four or five days, when they were not a little alarmed to see ten, eleven, and twelve o'clock come, without any news of their labourers; when they were relieved by the honest servant mentioned above, who had withstood the seduction of his countrymen, and informed his masters of the desertion of the four others. As soon as the snow was cleared away from the door, they dispatched the Indian to the corregidor of Quito, who with equal dispatch sent other Indians, threatening to chastise them severely if they were wanting in their duty.

But the fear of punishment was not sufficient to induce them to support the rigour of this situation; for within two days they deserted. The corregidor therefore, to prevent any other inconvenience, sent four Indians under the care of an alcalde, and gave orders for their being relieved every fourth day.

Twenty-three tedious days our artists spent on this rock, viz. to the 6th of September, and even without any possibility of finishing their observations of the angles: for when it was fair and clear weather with them, the others, on whose summits the signals which formed the triangles for measuring the degrees of the meridian, were hid in the clouds; and when those were clear, Pichincha was involved in clouds. It was therefore necessary to erect their signals in a lower situation, and in a more favourable region. This, however, did not produce any change in their habitation till the beginning of December; when, having finished the observations which particularly concerned Pichincha, they proceeded to others; but with no abatement either of inconveniences, cold, or fatigue; for the places where they made their observations being necessarily on the highest parts of the desarts, the only respite in which they enjoyed some little ease was during the short interval of passing from one to the other.

In all their stations subsequent to that on Pichincha, during their fatiguing mensuration of the degrees of the meridian, each company lodged in a field-tent, which, though small, they found less inconvenient than the hut on Pichincha; though at the same time they had more trouble, being oftener obliged to clear it from the snow, as the weight of it would otherwise have demolished the tent. At first, indeed, they pitched it in the most sheltered places; but on taking a resolution that the tents themselves should serve for signals, to prevent the inconvenience of having others of wood, they removed them to a more exposed situation, where the impetuosity of the winds sometimes tore up the piquets, and blew them down.

Though this mountain is famous for its great height, it is considerably lower than the mountain of Cotopaxi: but it is impossible to conceive the coldness of the summit of the last-mentioned mountain from that felt on this; since it must exceed every idea that can be formed by the human mind, tho' they are both seated in the midst of the torrid zone. In all this range of mountains, there is said to be a constant inferior boundary, beyond which the snow never melts: this boundary, in the midst of the torrid zone, is said by some to be 2434 fathoms above the level of the sea; by others, only 2400 feet. The snow indeed falls much lower, but then it is subject to be melted the very same day. It is affirmed, that there are in the Andes 16 volcanoes or burning mountains, which throw out fire and smoke with a terrible noise. The height of Chimborazo, said to be the highest peak of the Andes, has been determined by geometrical calculations to be 20,282 feet. But the great differences between the calculations of the height of mountains in other parts of the world, must very much diminish the credit of such calculations. Instances of this we have already given under the article ÆTNA. No less remarkable are the differences concerning the height of the peak of Teneriffe; which, according to the calculations of Varenius, is three miles and three quarters, or 19,800 feet; according to those of Dr Heberden, it is only 15,396 feet; and according to those of M. Feuille, is no more than 13,128 feet. From these specimens, we can scarce avoid concluding, that all the methods hitherto invented for calculating the exact height of mountains are insufficient.

As all or most rivers have their source in mountains, it is no wonder a great number run down the sides of the Andes. Some hurry along with a prodigious rapidity; while others form beautiful cascades, or run through holes in rocks, which look like bridges of a stupendous height. There is a public road through the mountains 1000 miles in length, part of which runs from Quito to Cusco.

ANDES, a hamlet of Mantua in Italy, the birthplace of Virgil. Hence the epithet *Andinus* (Silius Italicus). Now called *Pietola*, two miles to the west of Mantua.

ANDETRIUM; ANDRETIUM (Strabo); ANDECRIUM, or ANDRECIUM (Ptolemy): An inland town of Dalmatia. The genuine name is *Andetrium* (Inscription.) It is described as situated near Salonæ, on a naturally strong and inaccessible rock, surrounded with deep valleys, with rapid torrents; from which it appears to be the citadel now called *Clissa*. E. Long. 17. 46. N. Lat. 43. 20.

ANDEUSE, a city of Languedoc in France, situated in E. Long. 3. 40. and N. Lat. 43. 45.

ANDOMADUNUM; ANDOMATUNUM (Ptolemy); and ANTEMATUNUM (Antonine); CIVITAS LINGONUM (Tacitus): A city of Gallia Belgica; now *Langres* in Champagne, situated on an eminence (which seems to justify the termination *dunum*), on the borders of Burgundy, at the springs of the Marne. Tacitus calls an inhabitant *Lingon*. E. Long. 5. 22. N. Lat. 48. 0.

ANDOVER, a large market town in Hampshire, on the London road. It is seated on a branch of the river Test, and sends two members to parliament. It has several inns, which afford good accommodations for travellers; and has a market on Saturday, well stocked with provisions. It is governed by a bailiff, a steward, a recorder, ten approved men, and twenty-two capital burgesses, who yearly choose the bailiff, and he elects two serjeants at mace to attend him. The living is a vicarage, valued at 17l. 4s. 4d. in the king's books. W. Long. 0. 56. N. Lat. 51. 20.

ANDRADA (Diego de Payva d') or ANDRADIUS, a learned Portuguese, born at Conimbria, who distinguished himself at the council of Trent, where king Sebastian sent him as one of his divines. There is scarce any Catholic author who has been more quoted by the Protestants than he, because he maintained some opinions a little extravagant concerning the salvation of the Heathens. Andrada was esteemed an excellent preacher. His sermons were published in three parts, the second of which was translated into Spanish by Benedict de Alcoran. Many encomiums have been bestowed upon Andrada. Osorius, in his preface to the "Orthodox Explanations of Andradius," gives him the character of a man of wit, vast application, great knowledge in the languages, with all the zeal and eloquence necessary to a good preacher; and Rosweidus says, that he brought to the council of Trent the understanding of a most profound divine, and the eloquence of a consummate orator.

ANDRACHNE, Bastard Orpine: A genus of the gynandria order, belonging to the monœcia class of plants; and in the natural method ranking under the 38th order, *Tricoccæ*. The characters are; The male *calyx* consists of five leaves; the *corolla* has five petals; and the *stamina*, which are also five in number, are inserted into the stylus: The female *calyx* is divided into five leaves; there is no *corolla*; the *styli* are three; and the *capsule* is trilocular, containing three seeds.

Species. 1. The telephoides, or herbaceous trailing andrachne, is a low plant, whose branches trail upon the ground. The leaves are small, of an oval shape, smooth, and of a sea-green colour. It is found wild in some parts of Italy and the Archipelago; but is a plant of no great beauty, and therefore seldom cultivated. 2. The fruticosa, or shrubby bastard orpine, is a native of China and some places of America, where it rises 12 or 14 feet high. The leaves are spear-shaped, pointed, and smooth; and under them are produced the footstalks of the flowers, which are small, and of a herbaceous white colour. 3. The arborea, with a tree-like stalk. This species was discovered by the late Dr William Houston, growing naturally at Campeachy. It has a strong woody stem, which rises more than 20 feet high, and sends out many branches on every side. A fourth sort is also mentioned by Mr Miller as raised by him from seeds sent from Jamaica. It agrees in general with the third sort; but the leaves are somewhat like the laurel, only much larger.

Culture. The first species may be raised, by sowing the seeds in March, on a moderate hot-bed. The plants may be removed into small pots, and plunged into another very moderate hot-bed, to bring them forward; but in mild weather they should have plenty of air admitted to them, and be frequently refreshed with water. In June they will produce flowers, and the seeds will ripen in August and September.—The other species are very tender, and therefore must be kept constantly in the bark-stove. It is very difficult to procure good seeds of these sorts; the covers often containing nothing, though they appear very fair outwardly.

ANDRAPODISMUS, in ancient writers, the selling of persons for slaves. Hence also *andrapodistes*, a dealer in slaves, more particularly a kidnapper, who steals men or children to sell them; a crime for which the Thessalians were noted.

ANDRAPODOCAPELI, in antiquity, a kind of dealers in slaves. The *andrapodocapeli* had a particular process for taking off moles and the like disfigurements on the faces of the slaves they kept for sale, by rubbing them with bran. At Athens, several places in the forum were appointed for the sale of slaves. Upon the first day of every month, the merchants called Ανδραποδοκαπηλοι brought them into the market, and exposed them to sale; the crier standing upon a stone erected for that purpose, called the people together.

ANDREA (St), a small village on the Malabar coast in the East-Indies, founded originally by the Portuguese. It takes its name from a church dedicated to St Andrew, and served by the priests of St Thomas.—On the shore of St Andrea, about half a league out in the sea, lies Mud-bay, a place which few in the world can parallel. It is open to the wide ocean, and has neither island nor bank to break the force of the billows, which come rolling with great violence from all parts, in the south-west monsoons: but on this bank of mud they lose themselves in a moment; and ships lie on it as secure as in the best harbour, without motion or disturbance. It reaches about a mile along shore, and has been observed to shift its place from the northward about three miles in 30 years. From St Andrea to Kranganôr, about 12 leagues to the south, the water has the bad property of causing swellings in the legs of those who drink it constantly. Some it affects in one leg, and some in both. It causes no pain, but itching; nor does the swelled leg seem heavier to the owner than the small one, though some have been seen a yard in circumference at the ancle. The Romish legends impute the cause of this distemper (for which no preventative or cure hath been hitherto found) to a curse laid by St Thomas upon his murderers and their posterity; though, according to the Romans themselves, St Thomas was killed by the Tillinga priests at Meliaphûr, on the coast of Coromandel, about 400 miles distant, and where the natives have not this distemper.

ANDREAS (John), a celebrated canonist in the 14th century, was born at Mugello, near Florence; and was professor of canon-law at Padua, Pisa, and afterwards at Bologna. It is said that he macerated his body with fasting; and lay upon the bare ground every night for 20 years together, covered only with the skin of a bear. This is attested by very good authors; but if the story which Poggius tells of him in his Jests be true, he must afterwards have relaxed much of this continency: "Joannem Andream, (says he), doctorem Bonnoniensem, cujus fama admodum vulgata est, subagitantem ancillam domesticam uxor deprehendit: re insueta stupefacta mulier in virum versa, Ubi nunc, ait, Joannes, est sapientia vestra? ille nil amplius locutus, In vulva istius, respondit, loca admodum sapientiæ accommodato." The French translation of this perhaps will not be displeasing.

Jean, dit André, fameux Docteur des Loix,
Fut pris un jour au péché d'amourette:
Il acolloit une jeune soubrette.
Sa femme vint, fit un signe de croix.
Ho ho, dit elle, est ce vous? non je pense:
Vous, dont par tout en vante la prudence.
Qu'est devenu cet esprit si subtil?
Le bon André, pour suivant son négoce,
Honteux pourtant, ma foi, repondit il,
Prudence, esprit, tout gist dans cette fosse.

Since it is agreed that John Andreas had a bastard, this story is at the bottom very probable; and it was perhaps with the mother of Banicontius that his wife found him. Andreas had a beautiful daughter, named *Novella*, whom he loved extremely: and he is said to have instructed her so well in all parts of learning, that when he was engaged in any affair which hindered him from reading lectures to his scholars, he sent his daughter in his room; and lest her beauty should prevent the attention of the hearers, she had a little curtain drawn before her. To perpetuate the memory of this daughter, he intitled his commentary upon the Decretals of Gregory IX. the *Novellæ*. He married her to John Calderinus, a learned canonist. The first work of Andreas was his Gloss upon the Sixth Book of the Decretals, which he wrote when he was very young. He wrote also Glosses upon the Clementines; and a Commentary *in regulas Sexti*, which he entitled *Mercuriales*, because he either engaged in it on Wednesdays (*diebus Mercurii*), or because he inserted his Wednesdays disputes in it. He enlarged the Speculum of Durant, in the year 1347. This is all which Mr Bayle mentions of his writings, though he wrote many more. Andreas died of the plague at Bologna, in 1348, after he had been a professor 45 years; and was buried in the church of the Dominicans. Many eulogiums have been bestowed upon him. He has been called *Archidoctor decretorum:* In his epitaph, *Rabbi doctorum; lux, censor normaque morum;* "Rabbi of the doctors, the light, censor, and rule of manners:" And it is said, that Pope Boniface called him *lumen mundi*, "the light of the world."

ANDREAS (John) was born a Mahometan, at Xativa in the kingdom of Valencia, and succeeded his father in the dignity of alfaqui of that city. He was enlightened with the knowledge of the Christian religion by being present at a sermon in the great church of Valencia on the day of Assumption of the blessed Virgin, in the year 1487. Upon this he desired to be baptized; and, in memory of the calling of St John and St Andrew, he received the name John Andreas. "Having received holy orders (says he), and, from an alfaqui and a slave of Lucifer, become a priest and minister of Christ; I began, like St Paul, to preach and publish the contrary of what I had erroneously believed and asserted; and, with the assistance of Almighty God, I converted at first a great many souls of the Moors, who were in danger of hell, and under the dominion of Lucifer, and conducted them into the way of salvation. After this, I was sent for by the most catholic princes king Ferdinand and queen Isabella, in order to preach in Granada to the Moors of that kingdom, which their majesties had conquered: by God's blessing on my preaching, an infinite number of Moors were brought to abjure Mahomet, and to turn to Christ. A little after this, I was made a canon by their grace; and sent for again by the most Christian queen Isabella to Arragon, that I might be employed in the conversion of the Moors of those kingdoms, who still persisted in their errors, to the great contempt and dishonour of our crucified Saviour, aud the prodigious loss and danger of all Christian princes. But this excellent and pious design of her Majesty was rendered ineffectual by her death." At the desire of Martin Garcia, bishop of Barcelona, he undertook to translate from the Arabic, into the language of Arragon, the whole law of the Moors; and after having finished this undertaking, he composed his famous work of *The Confusion of the Sect of Mahumed:* it contains twelve chapters, wherein he has collected the fabulous stories, impostures, forgeries, brutalities, follies, obscenities, absurdities, impossibilities, lies, and contradictions, which Mahomet, in order to deceive the simple people, has dispersed in the writings of that sect, and especially in the alcoran, which, as he says, was revealed to him in one night by an angel, in the city of Meke; though in another place he contradicts himself, and affirms that he was 20 years in composing it. Andreas tells us, he wrote this work, that not only the learned among Christians, but even the common people might know the different belief and doctrine of the Moors: and on the one hand might laugh and ridicule such insolent and brutal notions, and on the other might lament their blindness and dangerous condition. This book, which was published at first in Spanish, has been translated into several languages; all those who write against the Mahometans quote it very much.

ANDREINI (Isabella), a native of Padua, was an excellent poetess, and one of the best comedians in Italy, towards the beginning of the 17th century. The Intenti of Pavia thought they did their Society an honour by admitting her a member of it; and she, in acknowledgement of this honour, never forgot to mention amongst her titles that of *Academica Infanta:* her titles were these, "Isabella Andreini, comica gelosa, academica infanta, detta l'accessa." She was also a woman of extraordinary beauty; which, added to a fine voice, made her charm both the eyes and ears of the audience. She died of a miscarriage, at Lyons, the 10th of June, 1604, in the 42d year of her age. Her death being a matter of general concern and lamentation, there were many Latin and Italian elegies printed to her memory: several of these pieces were placed before her poems in the edition of Milan, in 1605. Besides her sonnets, madrigals, songs, and eclogues, there is a pastoral of hers intitled Myrtilla, and letters, printed at Venice in 1610. She sung extremely well, played admirably on several instruments, understood the French and Spanish languages, and was not unacquainted with philosophy.

ANDRELINUS (Publius Faustus), born at Forli in Italy, he was a long time professor of poetry and philosophy in the university of Paris. Lewis XII. of France made him his poet laureat; and Erasmus tells us he was likewise poet to the queen. His pen was not wholly employed in making verses; for he wrote also moral and proverbial letters in prose, which were printed several times. His poems, which are chiefly in Latin, are inserted in Vol. I. of the *Deliciæ Poetarum Italorum*. Mr De la Monnoie tells us, "that Andrelinus, when he was but 22 years old, received the crown of laurel: That his love-verses, divided into four books, intitled *Livia*, from the name of his mistress, were esteemed so fine by the Roman Academy, that they adjudged the prize of the Latin elegy to the author." He died in 1518. This author's manner of life was not very exemplary; yet he was so fortunate, says Erasmus, that though he took the liberty of rallying the divines, he was never brought into trouble about it.

ANDREW (St), the apostle, born at Bethsaida in Galilee, brother to Simon Peter. He had been a disciple of John the baptist, and followed Jesus upon the testimony given of him by the batpist, (John i. 30, 37, &c.) He followed our Saviour with another of John's disciples, and went into the house where Jesus lodged: here he continued from about four o'clock in the afternoon till it was night. This was the first disciple whom our Saviour received into his train. Andrew introduced his brother Simon, and they passed a day with

with Christ, after which they went to the marriage in Cana (*id.* ii.), and at last returned to their ordinary occupation. Some months after, Jesus meeting them while they were both fishing together, called them to him, and promised to make them fishers of men. Immediately they left their nets, followed him, (Matt. iv. 19.) and never afterwards separated from him.

After our Saviour's ascension, his apostles having determined by lot what parts of the world they should severally take, Scythia and the neighbouring countries fell to St Andrew, who according to Eusebius, after he had planted the gospel in several places, came to Patræ in Achaia, where, endeavouring to convert the proconsul Ægeas, he was by that governnor's orders scourged and then crucified. The particular time of his suffering martyrdom is not known; but all the ancient and modern martyrologies, both of the Greeks and Latins, agree in celebrating his festival upon the 30th of November. His body was embalmed, and decently interred at Patræ by Maximilla, a lady of great quality and estate. Afterwards it was removed to Constantinople by Constantine the Great, and buried in the great church, which he had built to the honour of the apostles. There is a cross to be seen at this day in the church of St Victor at Marseilles, which is believed by the Romanists to be the same that St Andrew was fastened to. It is in the shape of the letter X, and is inclosed in a silver shrine. Peter Chrysologus says, that he was crucified upon a tree; and the spurious Hippolytus assures us it was an olive-tree.

ANDREW, or *Knights of St ANDREW*, an order of knights, more usually called the order of the thistle. (See THISTLE.)

Knights of St ANDREW, is also an order instituted by Peter the Great of Muscovy in 1698; the badge of which is a golden medal; on one side whereof is represented St Andrew's cross, with these words, *Cazar Pierre monarque de tout la Russie*. This medal, being fastened to a blue ribbon, is suspended from the right shoulder.

St ANDREW's Cross, one in form of the letter X. (See CROSS.)

St ANDREW's Day, a festival of the Christian church, celebrated on the 30th of November in honour of the apostle St Andrew.

ANDREW's (St), a town of Fifeshire, in Scotland, once the metropolis of the pictish kingdom, lying in W. Long. 2. 25. N. Lat. 56. 18. If we may credit legend, St Andrew's owes its origin to a singular accident. St Regulus (or St *Rule*, as he is likewise called), a Greek of Achaia, was warned by a vision to leave his native country, and visit Albion, an isle placed in the remotest part of the world; and to take with him the arm-bone, three fingers, and three toes of St Andrew. He obeyed, and set sail with his companions, but had a very tempestuous passage. After being tossed for some time on a stormy sea, he was at last shipwrecked on the coasts of Otholania, in the territories of Hergusus king of the picts, in the year 370. On hearing of the arrival of the Strangers, with their precious relicts, the king immediately gave orders for their reception, afterwards presenting the saint with his own palace, and building near it the church, which still bears the name of *St Regulus*.

At this time the place was stiled *Mucross*, or the *land of boars*: all round was forest, and the lands bestowed on the Saint were called *Byrehid*. The boars equalled in size the ancient Erymanthian; as a proof of which, two tusks, each sixteen inches long and four thick, were chained to the altar of St Andrew's. St Regulus changed the name to *Kilrymont*; and established here the first Christian priests of the country, called *Guldees*. This church was supreme in the kingdom of the Picts; Ungus having granted to God and St Andrew, that it should be the head and mother of all the churches in his dominions. He also directed that the cross of St Andrew should become the badge of the country. In 518, after the conquest of the Picts, he removed the episcopal see to St Andrew's, and the Bishop was styled *maximus Scotorum episcopus*. In 1441, it was erected into an archbishopric by Sextus IV. at the intercession of James III. In 1606, the priory was suppressed; and, in 1617, the power of election was transferred to eight bishops, the principal of St Leonard's college, the archdeacon, the vicars of St Andrew's, Leuchars, and Coupar. This see contained the greatest part of the shire of Fife, with a part of Perth, Forfar, and Kincardine shires, and a great number of parishes, churches, and chapels in other dioceses.

The town of St Andrew's was erected into a royal borough by David I. in the year 1140, and their privileges afterwards confirmed. The charter of Malcolm II. is preserved in the tolbooth; and appears written on a bit of parchment, but the contents equally valid with what would at this time require whole skins. Here also are kept the silver keys of the city; which, for form's sake, are delivered to the king, if he should visit the place, or to a victorious enemy, in token of submission. In this place, likewise, is to be seen the monstrous ax which, in 1646, took off the heads of Sir Robert Spotswood and other distinguished loyalists. The town underwent a siege in 1337; at which time it was possessed by the English, and other partizans of Baliol; but the loyalists, under the earls of March and Fife, made themselves masters of it in three weeks, by the help of their battering machines.

St Andrew's is now greatly reduced in the number of inhabitants; at present scarcely exceeding 2000. It is impossible to ascertain the sum when it was the seat of the primate: All that can be known is, that during the period of its splendor, there were between 60 and 70 bakers; but now 9 or 10 are sufficient for the place. It is a mile in circuit, and contains three principal streets. On entering the west port, a well-built street, straight, and of vast length and breadth, appears; but so grass-grown, and presenting such a dreary solitude, that it forms the perfect idea of having been laid waste by the pestilence.

The cathedral of St Andrew's was founded by Bishop Arnold in 1161, but did not attain its full magnificence till 1318. Its length from east to west was 370 feet; that of the transept, 322. But tho' this vast pile was 157 years in building, John Knox, in June 1559, effected its demolition in a single day; and so effectually has it been destroyed, that nothing now remains but part of the east and west ends, and of the south side.

Near the east end is the chapel of St Regulus; the tower of which is a lofty equilateral triangle, of 20 feet each side, and 103 feet high; the body of the chapel remains, Andrew's. remains, but the two side chapels are ruined. The arches of the windows and doors are round, and some even more than semicircles: an undoubted proof of their antiquity.

The priory was founded by Alexander I. in 1122; and the monks (canons regular of St Augustine) were brought from Scone, in 1140, by Robert, bishop of this see. By an act of parliament, in the time of James I. the prior had precedence of all abbots and priors, and on the days of festival wore a mitre and all episcopal ornaments. Dependent on this priory were those of Lochleven, Portmoak, Monimusk, the Isle of May, and Pittenweem, each originally a seat of the Culdees. The revenues of the house were vast, viz. In money 2237l. 2s. 10d 1-2; 38 chaldrons, 1 boll, 3 firlots of wheat; 132 ch. 7 bolls of bear; 114 ch. 3 bolls 1 peck of meal; 151 ch. 10 bolls 1 firlot 1 peck and a half of oats; 3 ch. 7 bolls of peas and beans: 480 acres of land also belonged to it. Nothing remains of the priory except the walls of the precinct, which show its vast extent. In one part is a most artless gateway, formed only of seven stones. This inclosure begins near the cathedral, and extends to the shore.

The other religious houses were, one of Dominicans, founded in 1274, by bishop Wishart; another of Observantines, founded by bishop Kennedy, and finished by his successor Patrick Graham in 1478; and, according to some, the Carmelites had a fourth.

Immediately above the harbour stood the collegiate church of Kirk-heugh, originally founded by Constantine III. who, retiring from the world, became here a Culdee. From its having been first built on a rock, it was styled, *Præpositura Sanctæ Mariæ de rupe.*

On the east side of the city are the poor remains of the castle, on a rock overlooking the sea. This fortress was founded, in 1401, by Bishop Trail, who was buried near the high altar of the cathedral, with this singular epitaph:

Hic fuit ecclesiæ directa columna, fenestra
Lucida thuribulum redolens, compana sonora.

This castle was the residence of cardinal Beaton; who, after the death of George Wishart, apprehending some danger, caused it to be fortified so strongly as to be at that time deemed impregnable. In this fortress, however, he was surprized and assassinated by Norman Lesly with 15 others. They seized on the gate of the castle early in the morning of May 29, 1546; it having been left open for the workmen who were finishing the fortifications; and having placed centinels at the door of the cardinal's apartment, they awakened his numerous domestics one by one; and, turning them out of the castle, they, without violence, tumult, or offering any injury to any other person, inflicted on Beaton the death he justly merited. The conspirators were immediately besieged in this castle by the regent, earl of Arran; and notwithstanding they had acquired no greater strength than 150 men, they resisted all his efforts for five months. This, however, was owing to the unskilfulness of the besiegers more than to the strength of the place or the valour of the besieged; for in 1547 the castle was reduced and demolished. The entrance of it is still to be seen; and the window is shown, out of which it is said the cardinal leaned to glut his eyes with the cruel martyrdom of George Wishart, who was burnt on a spot beneath. Andrew's.

In the church of St Salvator is a most beautiful tomb of bishop Kennedy, who died, an honour to his family, in 1466. The Gothic work is uncommonly elegant. Within the tomb were discovered six magnificent maces, which had been concealed here in troublesome times. One was given to each of the other three Scotch universities, and three are preserved here. In the top is represented our Saviour; around are angels, with the instruments of the passion.

With these are shown some silver arrows, with large silver plates affixed to them, on which are inscribed the arms and names of the noble youth, victors in the annual competitions in the generous art of archery, which were dropt but a few years ago; and golf is now the reigning game. That sport, and foot-ball, were formerly prohibited, as useless and unprofitable to the public; and at all *weapon schawings*, or reviews of the people, it was ordered, that *fute-ball and golfe be utterly cryed down, and that bow-markes be maid at ilk parish kirk, a pair of butts and schutting be used: and that ilk man schutte sax shottes at least, under the paine to be raiped upon them that cummis not, at least twa pennyes, to be given to them that cummis to the bow-markes to drinke.*

The celebrated university of this city was founded in 1411, by bishop Wardlaw; and the nex year he obtained from Benedict III. the bull of confirmation. It consisted once of three colleges. 1. St Salvator's, founded in 1458, by bishop Kennedy. This is a handsome building, with a court or quadrangle within: on one side is the church, on another the library; the third contains apartments for students: the fourth is unfinished. 2. St Leonard's college was founded by prior Hepburn, in 1522. This is now united with the last, and the buildings sold and converted into private houses. 3. The new, or St Mary's college, was established by archbishop Hamilton in 1553: but the house was built by James and David Bethune, or Beaton, who did not live to complete it. This is said to have been the site of a *schola illustris* long before the establishment even of the university; where several eminent clergymen taught, gratis, the sciences and languages. But it was called the *new college*, because of its late erection into a divinity college by the archbishop.

The university is governed by a chancellor, an office originally designed to be perpetually vested in the archbishop of St Andrew's; but since the reformation, he is elected by the two principals, and the professors of both the colleges.

The rector is the next great officer; to whose care is committed the privileges, discipline, and statutes of the university. The colleges have their rectors, and professors of different sciences, who are indefatigable in their attention to the instruction of the students, and to that essential article, their morals. This place possesses several very great advantages respecting the education of youth. The air is pure and salubrious; the place for exercise, dry and extensive; the exercises themselves are healthy and innocent. The university is fixed in a peninsulated country, remote from all commerce with the world, the haunt of dissipation. From the smallness of the society every student's character is perfectly known.

No

No little irregularity can be committed, but it is instantly discovered and checked: vice cannot attain a head in this place, for the incorrigible are never permitted to remain the corrupters of the rest.

The trade of St Andrew's was once very considerable. So late as the reign of Charles I. this place had 30 or 40 trading vessels, and carried on a considerable herring and white fishery, by means of busses, in deep water; which fisheries had for ages been the grand source of their commerce, wealth, and splendour. After the death of the king, this whole coast, and St Andrew's in particular, became a scene of murder, plunder, and rapine: every town suffered in proportion to its magnitude and opulence. Nor were those hypocritical ruffians satisfied with the shipping, merchandise, plate, cattle, and whatever came within their sight; they also laid the whole coast under contribution. St Andrew's was required to pay 1000l. but the inhabitants not being able to raise that sum after being thus plundered, the general compounded for 500l. which was raised by a loan at interest, and hath remained a burden upon the corporation, it is believed, ever since.

The harbour is artificial, guarded by piers, with a narrow entrance, to give shelter to vessels from the violence of a very heavy sea, from the encroachments of which it has suffered much. The manufactures this city might in former times possess, are now reduced to one, that of golf-balls; which, trifling as it may seem maintains a great number of people. It is, however, commonly fatal to the artists; for the balls are made by stuffing a great quantity of feathers into a leathern case, by help of an iron rod, with a wooden handle, pressed against the breast, which seldom fails to bring on a consumption.

ANDREW'S (Lancelot), bishop of Winchester, was born at London in 1555, and educated at Cambridge. After several preferments, he was made bishop, first of Chichester, then of Ely, and, in 1618, was raised to the see of Winchester. This very learned prelate, who was distinguished by his piety, charity and integrity, may be justly ranked with the best preachers and completest scholars of his age; he appeared to much greater advantage in the pulpit than he does now in his works, which abound with Latin quotations and trivial witticisms. His sermons, though full of puns, were suited to the taste of the times in which he lived, and were consequently greatly admired. He was a man of polite manners and lively conversation; and could quote Greek and Latin authors, or even pun with king James. There is a pleasant story related of him in the life of Waller the poet. When that gentleman was young, he had the curiosity to go to court, and stood in the circle to see king James dine; where, among other company, there sat at table two bishops, Neale and Andrews. The king proposed aloud this question, Whether he might not take his subjects money when he needed it, without all this formality of parliament? Neale replied, "God forbid you should not, for you are the breath of our nostrils." Whereupon the king turned, and said to the bishop of Winchester, "Well, my lord, what say you?" "Sir, (replied the bishop), I have no skill to judge of parliamentary cases." The king answered, "No puts-off, my lord; answer me presently." "Then, Sir (said he), I think it lawful for you to take my brother Neal's money, for he offers it." Mr Waller says, the company was pleased with this answer, but the wit of it seemed to affect the king; for a certain lord coming soon after, his majesty cried out, "O, my lord, they say you lig with my lady." "No, Sir (says his Lordship, in confusion), but I like her company because she has so much wit." "Why then (says the king) do you not lig with my lord of Winchester there?"—This great prelate was in no less reputation and esteem with king Charles I. than he had been with his predecessors. He died at Winchester-house in Southwark, September 27, 1626, in the 71st year of his age; and was buried in the parish-church of St Saviour's, where his executors erected to him a very fair monument of marble and alabaster, on which is an elegant inscription, in Latin, written by one of his chaplains. Mr Milton also, at 17 years of age, wrote a beautiful elegy on his death, in the same language. Bishop Andrews had, 1. A share in the translation of the Pentateuch, and the historical books from Joshua to the first book of Chronicles exclusively. He also wrote, 2. *Tortura Torti*, in answer to a work of Cardinal Bellarmine, in which that cardinal assumes the name of Matthew Tortus. 3. A Manual of Private Devotions: and, 4. A Manual of Directions for the Visitation of the Sick; besides the Sermons and Tracts in English and Latin, published after his death.

ANDRIA, in Grecian antiquity, public entertainments first instituted by Minos of Crete, and, after his example, appointed by Lycurgus at Sparta, at which a whole city or tribe assisted. They were managed with the utmost frugality, and persons of all ages were admitted, the younger sort being obliged by the lawgiver to repair thither as to schools of temperance and sobriety.

ANDRIA, is a city and a bishop's see in the territory of Bari, in the kingdom of Naples. It is pretty large, well peopled, and seated in a spacious plain, four miles from the Adriatic coast. E. Long. 17. 4. N. Lat. 41. 15.

ANDRISCUS, a man of mean extraction, who, pretending to be the son of Perseus last king of Macedonia, took upon him the name of *Philip*, for which reason he was called *Pseudo-Philippus*, the *False Philip*. After a complete victory over Juventus, the Roman Prætor sent against him, he assumed kingly power, but exercised it with vast cruelty. At last, the Romans obliged him to fly into Thrace, where he was betrayed and delivered into the hands of Metellus. This victory gained Macedonia once more into the power of the Romans, and to Metellus the name of *Macedonicus*, but cost the Romans 25,000 men. Andriscus adorned the triumph of Metellus, walking in chains before the general's chariot.

ANDROAS, or ANDRODAMAS, among ancient naturalists, a kind of pyritæ, to which they attributed certain magical virtues.

ANDROGEUS, in fabulous history, the son of Minos king of Crete, was murdered by the Athenian youth and those of Megara, who envied his being always victor at the Attic games. But Minos having afterwards taken Athens and Megara, obliged the inhabitants to send him an annual tribute of seven young men and as many virgins, to be devoured by the Minotaur; but Theseus delivered them from that tribute.

ANDROGYNES, in natural history, a name given

Androgynes.

ven to thoſe living creatutures which, by a monſtrous formation of their generative parts, ſeem (for it is only ſeeming) to unite in themſelves the two ſexes, that of the male and of the female. This *luſus naturæ*, this defect, or perhaps redundancy, in the animal ſtructure, is deſcribed by medical authors in the following manner. 'There is a depravation in the ſtructure of the 'parts intended by nature for propagation, when, be'ſides thoſe concealed parts that are found neceſſary 'for the diſcharge of prolific functions, the *pudenda* 'of the other ſex likewiſe appear. This monſtrous 'production of nature is diverſified in four different 'ways; of which three appear in males and one in fe'males. In men, the female pudendum cloathed with 'hair, ſometimes appears contiguous to the perinæum; 'at other times in the middle of the ſcrotum; at other 'times, which conſtitutes the third diverſity, through 'that part itſelf which in the midſt of the ſcrotum ex'hibits the form of a pudendum, urine is emitted. 'Near that part which is the teſt of puberty, and 'above the pudendum, even in females, the maſculine 'genitals appear in ſome, conſpicuous in all their three 'forms, one reſembling the *viretram* or yard, the other 'like the two teſticles: but for the moſt part it hap'pens, that, of the two inſtruments of generation, one 'is feeble and inert; and it is extremely rare that both 'are found ſufficiently valid and proper for feats of 'love; nay, even in a great many, both theſe mem'bers are deficient and impotent, ſo that they can per'form the office neither of a male nor of a female.'

With reſpect to them, it appears, from a collation of all the circumſtances which have been obſerved by naturaliſts worthy of credit, that there is no ſuch thing as a perfect *androgyne*, or real hermaphrodite; that is to ſay, a living creature which, by its unnatural, or rather preternatural ſtructure, poſſeſſes the genuine powers of both ſexes, in ſuch a manner as to be qualified for performing the functions of either with ſucceſs: the irregularity of their fabrication almoſt always conſiſts in ſomething ſuperfluous added to one of the two ſexes, which gives it the appearance of the other, without beſtowing the real and characteriſtical diſtinction; and every *hermaphrodite* is almoſt always a very woman. Since this monſtrous exhibition of nature is not ſuch as to abrogate the rights or deſtroy the character of humanity amongſt human beings, this involuntary misfortune implies no right to deprive thoſe upon whom it is inflicted by nature, of the privileges natural to every citizen; and this deficiency is no more infectious than any other corporeal mutilation, it is not eaſy to ſee why marriage ſhould be prohibited to one of theſe unhappy beings, merely on account of its equivocal appearance, which acts in the character of its prevailing ſex. If ſuch a creature, by the defect of its conſtruction, ſhould be barren; this does not infer any right of diſſolving the marriage which it may have contracted, more than the ſame ſterility proceeding from any cauſe whether known or unknown, if his or her conſort ſhould not on that account require a divorce. It is only the licentious abuſe either of one or the other ſex which can be ſubjected to the animadverſion of the police. See Hermaphrodite.

Such are the ſentiments of the authors of the French Encyclopedie. After all, we cannot forbear to add, that from ſuch heterogenous matches nature ſeems to recoil with innate and inextinguiſhable horror. Nor are any of theſe invincible averſions implanted in our frame without a final cauſe worthy of its Author. We would gladly aſk theſe free-thinking gentlemen, in caſes where the ſexes are ſo unnaturally confounded, how the police can, by its moſt ſevere and rigorous animadverſions, either detect or prevent thoſe licentious abuſes againſt which they remonſtrate? Since, therefore, an evil ſo baneful to human ſociety could no otherwiſe be prevented than by the ſanction of Nature againſt ſuch horrible conjunctions, the inſtinctive antipathy which they inſpire was highly worthy of her wiſdom and purity.

Androgynes, Androgynous.

Androgynes, in ancient mythology, creatures of whom, according to the fable, each individual poſſeſſed the powers and characters of both ſexes, having two heads, four arms and two feet. The word itſelf is compounded of two Greek radical words; ανηρ, in genitive ανδρος, a *male*; and γυνη a *female*. Many of the rabbinical writers pretend, that Adam was created double, one body being male, the other female, which in their origin not being eſſentially joined, God afterwards did nothing but ſeparate them.

The gods, ſays Plato in his *Banquet*, had formed the ſtructure of man round, with two bodies and two ſexes. This fantaſtic being, poſſeſſing in itſelf the whole human ſyſtem, was endowed with a gigantic force, which rendered it inſolent, inſomuch that it reſolved to make war againſt the gods. Jupiter, exaſperated, was going to deſtroy it; but, ſorry at the ſame time to annihilate the human race, he ſatisfied himſelf with debilitating this double being, by disjoining the male from the female, and leaving each half to ſubſiſt with its own powers alone. He aſſigned to Apollo the taſk of repoliſhing theſe two half bodies, and of extending their ſkins ſo that their whole ſurface might be covered. Apollo obeyed, and faſtened it at the *umbilicus*: If this half ſhould ſtill rebel, it was once more to be ſubdivided by another ſection, which would only leave it one of the parts of which it was then conſtituted; and even this fourth of a man was to be annihilated, if it ſhould perſiſt in its obſtinacy and miſchief. The idea of theſe *androgynes* might well be borrowed from a paſſage in Moſes, where that hiſtorian of the birth and infancy of nature deſcribes Adam as calling Eve *bone of his bone* and *fleſh of his fleſh*. However this may be, the fable of Plato has been uſed with great ingenuity by a French poet, who has been rendered almoſt as conſpicuous by his misfortunes as by his verſes. With the ancient philoſopher, he attributes the propenſity which attracts one of the ſexes towards the other, to the natural ardor which each half of the *androgynes* feel for reunion; and their inconſtancy, to the difficulty which each of the ſeparated parts encounters in its efforts to recover its proper and original half. If a woman appears to us amiable, we inſtantly imagine her to be that moiety with whom we ſhould only have conſtituted one whole, had it not been for the inſolence of our original double-ſexed progenitor:

> The heart, with fond credulity impreſs'd,
> Tells us the half is found, then hopes for reſt;
> But 'tis our curſe, that ſad experience ſhows,
> We neither find our half nor gain repoſe.

ANDROGYNOUS, in zoology, an appellation given to animals which have both the male and female

Androides. ſex in the ſame individual.—In botany, the term is applied to ſuch plants as bear both male and female flowers on the ſame root.

ANDROIDES, in mechanics, a human figure, which, by certain ſprings or other movements, is capable of performing ſome of the natural motions of a living man. The motions of the human body are more complicated, and conſequently more difficult to be imitated, than thoſe of any other creature; whence the conſtruction of an *androides*, in ſuch a manner as to imitate any of theſe actions with tolerable exactneſs, is juſtly ſuppoſed to indicate a greater ſkill in mechanics than any other piece of workmanſhip whatever.

A very remarkable figure of this kind appeared in Paris, in the year 1738. It repreſented a flute player, and was capable of performing many different pieces of muſic on the German flute; which, conſidering the difficulty of blowing that inſtrument, the different contractions of the lips neceſſary to produce the diſtinctions between the high and low notes, and the complicated motions of the fingers, muſt appear truly wonderful.

This machine was the invention of M. Vaucanſon, member of the Royal Academy of Sciences; and a particular deſcription of it was publiſhed in the Memoirs of the Academy for that year.

The figure itſelf was about five feet and an half in height, ſituated at the end of an artificial rock, and placed upon a ſquare pedeſtal four feet and an half high and three and an half broad. The air entered the body by three pipes ſeparated one from the other. It was conveyed to them by nine pair of bellows, three of which were placed above and ſix below. Theſe were made to expand and contract regularly in ſucceſſion, by means of an axis of ſteel turned round by ſome clock-work. On this axis were different protuberances at proper diſtances, to which were fixed cords thrown over pullies, and terminating in the upper boards of the bellows, ſo that, as the axis turned, theſe boards were alternately raiſed and let down. A contrivance was alſo uſed to prevent the diſagreeable hiſſing fluttering noiſe uſually attending the motion of bellows. This was by making the cord, by which the bellows was moved, preſs in its deſcent, upon one end of a ſmaller lever, the other end of which aſcending forced open the ſmall leathern valve that admitted the air, and kept it ſo, till, the cord being relaxed by the deſcent of the upper board, the lever fell, and the air was forced out. Thus the bellows performed their functions conſtantly without the leaſt hiſſing or other noiſe by which it could be judged in what manner the air was conveyed to the machine. The upper boards of three of the pairs of bellows were preſſed down by a weight of four pounds, thoſe of three others by a weight of two pounds, and thoſe of the three remaining ones by nothing but their own weight.

The three tubes, by which the air entered, terminated in three ſmall reſervoirs in the trunk of the figure. There they united, and, aſcending towards the throat, formed the cavity of the mouth, which terminated in two ſmall lips adapted in ſome meaſure to perform their proper functions. Within this cavity alſo was a ſmall moveable tongue; which by its play, at proper periods, admitted the air, or intercepted its paſſage to the flute.

The fingers, lips, and tongue, received their proper directions by means of a ſteel cylinder turned by clock-work. It was divided into 15 equal parts, which by means of pegs, preſſing upon the ends of 15 different levers, cauſed the other extremities to aſcend. Seven of theſe levers directed the fingers, having wires and chains fixed to their aſcending extremities, which being attached to the fingers, cauſed them to aſcend in proportion as the other extremity was preſſed down by the motion of the cylinder, and *vice verſa*. Thus the aſcent or deſcent of one end of a lever produced a ſimilar aſcent or deſcent in the correſponding finger, by which one of the holes of the flute was occaſionally opened or ſtopped, as by a living performer. Three of the levers ſerved to regulate the ingreſs of the air, being contrived ſo as to open and ſhut, by means of valves, the three reſervoirs of air abovementioned, ſo that more or leſs ſtrength might be given, and a higher or lower note produced as occaſion required. The lips were by a ſimilar mechaniſm, directed by four levers, one of which opened them, to give the air a freer paſſage; the other contracted them; the third drew them backward; and the fourth puſhed them forward. The lips were projected upon that part of the flute which receives the air; and, by the different motions already mentioned, modified the tone in a proper manner. The remaining lever was employed in the direction of the tongue, which it eaſily moved, ſo as to ſhut or open the mouth of the flute.

Thus we ſee how all the motions neceſſary for a German-flute-player could be performed by this machine; but a conſiderable difficulty ſtill remains, namely, how to regulate theſe motions properly, and make each of them follow in juſt ſucceſſion. This, however, was effected by the following ſimple method. The extremity of the axis of the cylinder was terminated on the right ſide by an endleſs ſcrew, conſiſting of twelve threads, each placed at the diſtance of a line and an half from the other. Above this ſcrew was fixed a piece of copper, and in it a ſteel pivot, which, falling in between the threads of the ſcrew, obliged the cylinder to follow the threads, and, inſtead of turning directly round, it was continually puſhed to one ſide. Hence, if a lever was moved, by a peg placed on the cylinder in any one revolution, it could not be moved by the ſame peg in the ſucceeding revolution, becauſe the peg would be moved a line and a half beyond it by the lateral motion of the cylinder. Thus, by an artificial diſpoſition of theſe pegs in different parts of the cylinder, the ſtatue was made, by the ſucceſſive elevation of the proper levers, to exhibit all the different motions of a flute-player, to the admiration of every one who ſaw it.

The conſtruction of machines capable of imitating even the mechanical actions of the human body, ſhow exquiſite ſkill; but what ſhall we ſay of one capable, not only of imitating actions of this kind, but of acting as external circumſtances require, as though it were endowed with life and reaſon? This, nevertheleſs, has been done. M. de Kempelon, a gentleman of Preſburg in Hungary, excited by the performances of M. de Vancanſon, at firſt endeavoured to imitate them, and at laſt far excelled them. This gentleman conſtructed an Androides capable of playing at cheſs!—Every one who is in the leaſt acquainted with this game muſt know, that it is ſo far from being mechanically performed, as to require a greater exertion of the judgment

ment and rational faculties than is sufficient to accomplish many matters of greater importance. An attempt therefore, to make a wooden chess-player, must appear as ridiculous as to make a wooden preacher or counsellor of state. That this machine really was made, however, the public have had ocular demonstration. The inventor went to Britain in 1783, where he remained above a year with his automaton.

It is a figure as large as life, in a Turkish dress, sitting behind a table with doors, of three feet and a half in length, two in depth, and two and a half in height. The chair on which it sits is fixed to the table, which runs on four wheels. The automaton leans its right arm on the table, and in its left hand holds a pipe: with this hand it plays after the pipe is removed. A chess-board of 18 inches is fixed before it. This table, or rather cupboard, contains wheels, levers, cylinders, and other pieces of mechanism; all which are publicly displayed. The vestments of the automaton are then lifted over its head, and the body is seen full of similar wheels and levers. There is a little door in its thigh, which is likewise opened; and with this, and the table also open, and the automaton uncovered, the whole is wheeled about the room. The doors are then shut, and the automaton is ready to play; and it always takes the first move.

At every motion the wheels are heard; the image moves its head, and looks over every part of the chess-board. When it checks the queen, it shakes its head twice, and thrice in giving check to the king. It likewise shakes its head when a false move is made, replaces the piece, and makes its own move; by which means the adversary loses one.

M. de Kempelen remarks, as the most surprising circumstance attending his automaton, that it had been exhibited at Presburg, Vienna, Paris, and London, to thousands, many of whom were mathematicians and chess-players, and yet the secret by which he governed the motion of its arm was never discovered. He prided himself solely on the construction of the mechanical powers, by which the arm could perform ten or twelve moves. It then required to be wound up like a watch, after which it was capable of continuing the same number of motions.

The automaton could not play unless M. de Kempelen or his substitute was near it to direct its moves. A small square box, during the game, was frequently consulted by the exhibiter; and herein consisted the secret, which he said he could in a moment communicate. He who could beat M. de Kempelen was, of course, certain of conquering the automaton. It was made in 1769. His own account of it was; "C'est une bagatelle qui n'est pas sans merite du cote du mechanisme, mais les effets n'en paroissent si mervelleux que par la hardiesse de Pidee, & par l'heureux choiz dez moyens employes pour faire illusion."

The strongest and best-armed loadstone was allowed to be placed on the machine by any of the spectators.

As the inventor of this admirable piece of mechanism hath not yet thought proper to communicate to the public the means by which it is actuated, it is in vain for any, except those who are exquisitely skilled in mechanics, to form conjectures concerning them.—Many other curious imitations of the human body, as well as that of other animals, have been exhibited, though none of them equal to the last mentioned one. See the article AUTOMATON.

ANDROLEPSY, in Grecian antiquity, an action allowed by the Athenians against such as protected persons guilty of murder. The relations of the deceased were empowered to seize three men in the city or house whether the malefactor had fled, till he were either surrendered, or satisfaction made some way or other for the murder.

ANDROMACHE, the wife of the valiant Hector, the mother of Astyanax, and daughter of Eton king of Thebes in Cilicia. After the death of Hector and the destruction of Troy, she married Pyrrhus; and afterwards Helenus the son of Priam, with whom she reigned over part of Epirus.

ANDROMEDA, in astronomy, a northern constellation, behind Pegasus, Cassiopeia, and Perseus. It represents the figure of a woman chained; and is fabled to have been formed in memory of Andromeda, daughter of Cepheus and Cassiopeia, and wife of Perseus, by whom she had been delivered from a sea-monster, to which she had been exposed to be devoured for her mother's pride. Minerva translated her into the heavens.

The stars in the constellation Andromeda in Ptolemy's catalogue are 23, in Tycho's 22, in Bayer's 27, in Mr Flamstead's no less than 84.

ANDROMEDA, the name of a celebrated tragedy of Euripides, admired by the ancients above all the other compositions of that poet, but now lost.

It was the representation of this play, in a hot summer day, that occasioned that epidemic fever, or phrenzy, for which the Abderites are often mentioned, wherein they walked about the streets, rehearsing verses, and acting parts of this piece. See ABDERA.

ANDROMEDA, or *Marsh Cystus:* A genus of the monogynia order, belonging to the decandria class of plants; and in the natural method ranking under the 18th order, *Bicornes*. The characters are: The *calyx* is a quinquepartite perianthium, small, coloured, and persistent: The *corolla* is monopetalous, campanulated, and quinquefid, with reflected divisions: The *stamina* consist of ten subulated filaments, shorter than the corolla; the antheræ two-horned and nodding: The *pistillum* has a roundish germen: a cylindrical stylus larger than the stamina, and persistent; and an obtuse stigma: The *pericarpium* is a roundish five-cornered capsule, with five cells and five valves: The *seeds* are very numerous, roundish, and glossy.

Species. 1. The polifolia is a low plant, growing naturally in bogs in the northern countries. It is difficultly preserved in gardens; and, being a plant of no great beauty, is seldom cultivated. 2. The mariana, a native of North America. It is a low shrub, sending out many woody stalks from the root, which are garnished with oval leaves placed alternately; the flowers are collected in small bunches, are of an herbaceous colour, and shaped like those of the strawberry-tree. They appear in June and July. 3. The paniculata* is a native of Virginia and Carolina, growing in moist places. The plants usually arrive at the height of ten feet, with thin leaves set alternately, and having their edges finely serrated. The flowers are tubulous, small, and of a greenish white, closely set horizontally on one side of the slender stalks. These flowers are succeeded by berries, which open when ripe; and divide into five sections,

* Plate XXXI. fig. 2.

tions, inclosing many small seeds. 4. The arborea is a native of the same countries, where it is called the *sorrel-tree*. It grows to the height of 20 feet, with a trunk usually five or six inches thick. The branches are slender, thick set with leaves like those of the pear-tree. From the ends of the branches proceed many slender stalks, on one side of which hang many small white flowers like those of the strawberry-tree. 5. The calyculata, is a native of Siberia, and likewise of North-America. It grows on mossy land, and is therefore very difficult to keep in gardens. The leaves are shaped like those of the box-tree, and are of the same consistence, having several small punctures on them. The flowers grow in short spikes from the extremity of the branches. They are produced single between two leaves, are of a white colour, and a cylindrical or picher-like shape. There are ten other species.

Propagation and Culture. All these sorts, except four, are hardy plants. The fourth species requires to be sheltered from frost in winter, but in the summer should be frequently watered.

The above plants succeed best upon boggy and moist grounds. You must procure the seeds from the places where they grow naturally; a year before which a boggy or the moistest part of your garden should be dug, and the roots of all weeds cleared off. As the weeds begin to rise, so constantly should the ground be again dug, and sea or drift sand should be plentifully mixed with the natural soil. By this management till the seeds arrive, the ground being made tolerably fine, the seeds should be sown very shallow in the moist or boggy land; or if the land should be so boggy that it cannot be easily worked so as to be proper for the reception of the seeds, then let a sufficient quantity of soil from a fresh pasture, mixed with drift sand, be laid over the bog, and let the seeds be sown therein. The bog will in time absorb this soil, but the seeds will come up; and this is the most effectual method of procuring plants of this kind from seeds. The first year after they come up they should be shaded in very hot weather: and after that they will require little or no care. Another method of increasing these shrubs is by layers or suckers; so that whoever has not the conveniency of procuring the seeds from abroad, should get a plant or two of the sorts he most likes. These he should plant in a boggy situation, and in a very little time he will have increase enough; for they throw out suckers in prodigious plenty, and, if they like the situation, to a great distance. These may be taken off, and planted where they are to remain.

ANDRON, in Grecian antiquity, denotes the apartment in houses designed for the use of men; in which sense it stands opposed to *Gynæceum*.—The Greeks also gave their dining-rooms the title of *andron*, because the women had no admittance to feasts with the men.

ANDRONA, in ancient writers, denotes a street, or public place, where people met and conversed together. In some writers, *androna* is more expressly used for the space between two houses; in which sense, the Greeks also use the term ανδρωνας, for the way or passage between two apartments.

ANDRONA is also used, in ecclesiastical writers, for that part in churches destined for the men. Anciently it was the custom for the men and women to have separate apartments in places of worship, where they performed their devotions asunder; which method is still religiously observed in the Greek church. The ανδρων, or *androna*, was in the southern side of the church, and the womens apartment on the northern.

ANDRONICUS I. Emperor of the East, caused Alexius II. who had been put under his care, to be strangled; and then took possession of the throne of Constantinople in 1183: but the people becoming exasperated at his cruelties, proclaimed Isaac Angelus emperor, and put Andronicus in irons: they then thrust out his eyes; and, having led him through the city in an ignominious manner, hanged him.

ANDRONICUS *of Cyrrhus*, built at Athens an octagon tower, with figures carved on each side, representing the eight principal winds. A brass triton at the summit, with a rod in its hand, turned round by the wind, pointed to the quarter from whence it blew. From this model is derived the custom of placing weather-cocks on steeples.

ANDROPHAGI, in ancient geography, the name of a nation whose country, according to Herodotus, was adjacent to Scythia. Their name, compounded of two Greek words, signifies *man-eaters*. Herodotus does not inform us whether their manner of subsisting corresponded with their name; whether they were so savage as to eat human flesh. See the article ANTHROPOPHAGI. They are represented, however, as the most barbarous and fierce of all nations. They were not governed by laws: the care of their cattle was their chief employment. Their dress was like that of the Scythians; and they had a language peculiar to themselves.

ANDROPOGON, or MAN'S-BEARD, in botany: A genus of the monœcia order, belonging to the polygamia class; and in the natural method ranking under the 4th order, *Gramina*. The *hermaphrodite* calyx is a one-flowered bivalved glume: The *corolla* is a bivalved glume awn'd at the base: The *stamina* consist of three capillary filaments; the antheræ are oblong and bifurcated: The *pistillum* has an oval germen; with two capillary styli coalesced, and villous stigmata: There is no *pericarpium*: The *seed* is one, solitary, and covered. The *male* calyx, corolla, and stamina, the same with the hermaphrodite; but the corolla without the awn.—There are above 18 species. Of these the most remarkable is the nardus, which produces the Indian nard or spikenard of the shops. The spikenard, as brought from the East Indies, is a congeries of small fibres issuing from one head, and matted close together, so as to form a bunch about the size of the finger, with some small strings at the opposite end of the head. The matted fibres (which are the parts chosen for medicinal purposes) are supposed by some to be the head or spike of the plant, by others the root: they seem rather to be the remains of the withered stalks, or the ribs of the leaves: sometimes entire leaves and pieces of stalks are found among them: we likewise now and then meet with a number of these bunches issuing from one root. Spikenard has a warm, pungent, bitterish taste; and a strong not very agreeable smell. It is stomachic and carminative; and said to be alexipharmac, diuretic, and emmenagogue; but at present it is very little employed.

ANDROS, one of the ancient Cyclades, lying between

tween Tenedos and Eubœa: being one mile distant from the former, and ten from the latter. The ancients gave it various names, viz. Cauros, Lysia, Nonagria, Epagris, Antandros, and Hydrusia. The name of *Andros* it received from one Andreus, appointed, according to Diodorus Siculus, by Rhadamanthus, one of the generals, to govern the Cyclades, after they had of their own accord submitted to him. As to the name of *Antandros*, the same author tells us, that Ascanius the son of Æneas, being taken prisoner by the Pelasgians, gave them this island for his ransom, which on that account was called *Antandros*, or "delivered for one man." The name of *Hydrusia* it obtained in common with other places well supplied with water. It had formerly a city of great note, bearing the same name, and situated very advantageously on the brow of an hill which commanded the whole coast. In this city, according to Strabo and Pliny, stood a famous temple dedicated to Bacchus. Near this temple Mutianus, as quoted by Pliny, tells us, there was a spring called the *gift of Jupiter;* the water of which had the taste of wine in the month of January, during the feast of Bacchus, which lasted seven days. The same author adds, that the waters, if carried to a place where the temple could not be seen, lost their miraculous taste. Pausanius makes no mention of this spring; but says, that, during the feast of Bacchus, wine flowed, or was at least by the Andrians believed to flow, from the temple of that god. The priests, no doubt, found their account in keeping up this belief, by conveying, through secret conduits, a great quantity of wine into the temple.

The Andrians were the first of all the islanders who joined the Persians at the time Xerxes invaded Greece; and therefore Themistocles, after the victory at Salamis, resolved to attack the city of Andros, and oblige the inhabitants to pay large contributions for the maintenance of his fleet. Having landed his men on the island, he sent heralds to the magistrates, acquainting them, that the Athenians were coming against them with two powerful divinities, *persuasion* and *force*; and therefore they must part with their money by fair means or foul. The Andrians replied, that they likewise had two mighty deities who were very fond of their island, viz. *poverty* and *impossibility;* and therefore could give no money. Themistocles, not satisfied with this answer, laid siege to the town; which he probably made himself master of and destroyed, as we are informed by Plutarch, that Pericles, a few years after, sent thither a colony of 250 Athenians. It was, however, soon retaken by the Persians; and, on the overthrow of that empire by Alexander the Great, submitted to him, along with the other islands. On his death it sided with Antigonus, who was driven out by Ptolemy. The successors of the last mentioned prince held it to the time of the Romans; when Attalus, king of Pergamus, besieged the metropolis at the head of a Roman army; and, having taken it, was by them put in possession of the whole island. Upon the death of Attalus, the republic claimed this island, as well as his other dominions, in virtue of his last will.

Andros is now subject to the Turks; and contains a town of the same name, with a great many villages. It is the most fruitful island in all the Archipelago, and yields a great quantity of silk. There are said to be about 6000 inhabitants, besides those of the villages Arni and Amoldeos, who are about two hundred, have a different language and customs, and are called *Albanois.* There are 7 monasteries, a great number of churches, and a cathedral for the bishops of the Roman catholic persuasion; but most of the inhabitants are of the Greek communion. The Jesuits had a house and a church in this island; but they were forced to quit them long ago. Here are some delightful valleys; but the air is bad, and the water of the city worse. The women would be agreeable enough, if it was not for their dress, which is very unbecoming; for they stuff out their clothes without the least regard to their shape; but the Albanese women make a much better appearance. The peasants make wicker-baskets, wherewith they supply the greatest part of the Archipelago. They have all sorts of game in the woods and mountains, but know not how to take them for want of guns. Their principal food is goats flesh; for there is no fish to be met with on their coasts. When they are sick, they are obliged to let the disease take its natural course, having neither physician nor surgeon on the island. A cadi, assisted by a few of the principal persons of the island, has the management of civil affairs, and his residence is in the castle: an aga, who presides over the military force, lives in the tower without the city. About two miles from the present town are still to be seen the ruins of a strong wall with the fragments of many columns, chapiters, bases, broken statues, and several inscriptions, some of which mention the senate and people of Andros, and the priests of Bacchus; from which it is probable that this was the site of the ancient city. E. Long 25. 30. N. Lat. 37. 50.

ANDROS (anc. geog.), an island in the Irish sea, (Pliny), called *Hedros* by Ptolemy: Now *Bardsey*, distant about a mile from the coast of North-Wales.

ANDROSACE: a genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 21st order, *Preciæ.* The essential characters are, The *male* calyx is five-leaved; the corolla is five-petaled; the stamina are five, inserted in the rudiment of the stylus: The *female* calyx is five-leaved; the corolla is wanting; the styli are three; the capsule is trilocular; the seeds are two. of this genus Dr Linnæus reckons six.

Species. 1. The maxima grows naturally in Austria and Bohemia, among the corn. It hath broad leaves, which spread near the ground; from the centre of these the footstalks arise, which are terminated by an umbel of white flowers like those of the auricula. These appear in April and May, and the seeds ripen in June; soon after which the plants perish. 2. The septentrionalis, villosa, carnea, and lactea, grow naturally on the Alps and Helvetian mountains, as also in Siberia. They are much smaller than the former, seldom growing more than three inches high. Of the other species called the *elongata*, we have no particular description.

Culture. These plants are propagated by seeds, which should be sown soon after they are ripe, otherwise they seldom come up the same year. If permitted to scatter, they will grow better than when they are sown.

ANDRUM, a kind of hydrocele, to which the people of Malabar are very subject.—Its origin is derived from the vitious quality of the country waters, impregnated with corrosive muriatic salts, the source of most other diseases that infect the Malabarians. Its signs, or symptoms, are an erysipelas of the scrotum, returning every new moon, by which the lymphatics, being eroded, pour a serous saline humour into the cavity of the scrotum. The andrum is incurable; those once seized with it have it for life: but it is not dangerous, nor very troublesome, to those used to it; tho' sometimes it degenerates into an hydrosarcocele. The method of prevention is by a heap of sand fetched from a river of the province Mangatti, and strewed in the wells. This is practised by the rich. As to the cure, they have only a palliative one; which is by incision, or tapping, and drawing off the water from the scrotum, once in a month or two.

ANDRYALA, DOWNY SOW-THISTLE: a genus of the polygamia æqualis order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Composita-semiflosculus*. The essential characters are: The receptacle is villous; the calyx is many parted, subequal, and rounded; and the pappus is simple and sessile.

Species. 1. The integrifolia is an annual plant, growing naturally in the south of France, Spain, and Italy. It rises to the height of a foot and an half, with woolly branching stalks. The flowers are produced in small clusters at the top of the stalks. They are yellow, and like those of the sow-thistle; so do not make any great appearance. 2. The ragusina is a native of the Cape of Good Hope. The leaves are extremely white, and much indented on their edges. The flower-stalks grow about a foot high, having small clusters of yellow flowers, which appear in July. The seeds sometimes ripen in Britain, but not always. 3. The lanata is a native of Sicily and of the country round Montpelier. The lower leaves are indented and woolly, but those on the stalks are entire. It seldom rises more than a foot high, supporting a few yellow flowers at top. 4. The sinuata grows in Spain and Portugal: the leaves are broader, longer, and more downy, than either of the other sorts; the flower-stalks rising more than a foot high. They branch into several foot-stalks, each sustaining one large yellow flower, shaped like those of hawk-weed, which are succeeded by oblong black seeds covered with down.

Culture. All these plants are easily propagated by seeds, which should be sown in autumn, where they are to remain, and will require no other culture than to thin them where they are too close, and to keep them free from weeds. The third sort must have a light dry soil.

ANDUXAR, a city in the province of Andalusia, in Spain, seated on the river Guadalquiver, 25 miles east of Cordova. It is pretty large, indifferently rich, and defended by a good castle. It is adorned with handsome churches and several religious houses, and inhabited by many families of high rank. The land about it abounds in corn, wine, oil, honey, and fruit of all sorts; and the inhabitants carry on a considerable trade in silk. W. Long. 4. 2. N. Lat. 37. 45.

ANDUZE, a town of France in Lower Languedoc, seated on the river Gardon. It carries on a considerable trade in serges and woollen cloth. E. Long. 3. 42. N. Lat. 43. 39.

ANEAU (Bartholomew), a native of Bourges in France, a man of eminent learning in the 16th century, educated under Melchior Volmar. He was professor at Lyons, where he propagated the doctrines of the Reformation secretly for a long time: but on the festival of the Holy Sacrament 1565, as the procession was passing on towards the college, there was a large stone thrown from one of the windows, upon the Host and priest who carried it. The people, enraged at this, broke into the college, and assassinated Mr Aneau, whom they imagined to have been the occasion, and the college itself was shut up next day by order of the city.

ANECDOTE, ANECDOTA, a term used by some authors, for the title of *Secret Histories*; but it more properly denotes a relation of detached and interesting particulars. The word is Greek ανεκδοτα, q. d. *things not yet known*, or *hitherto kept secret*. Procopius gives this title to a book which he published against Justinian and his wife Theodora; and he seems to be the only person among the ancients who has represented princes such as they are in their domestic relation.—Varillas has published Anecdotes of the House of Medicis.

ANECDOTES is also an appellation given to such works of the ancients as have not yet been published. In which sense, M. Muratori gives the name *Anecdota Græca* to several writings of the Greek fathers, found in the libraries, and first published by him.—F. Martene has given a *Thesaurus Anecdotarum Novus*, in folio, 5 vols.

ANEE, in commerce, a measure for grain, used in some provinces of France. At Lyons, it signifies also a certain quantity of wine, which is the load an ass can carry at once: which is fixed at 80 English quarts, wine-measure.

ANEMOMETER, in mechanics, implies a machine for measuring the force and velocity of the wind.

Various machines of this kind have been invented at different times, and by different persons. The following has been often experienced, and found to answer the intention.

An open frame of wood, ABCDEFGHI*, is supported by the shaft or arbor I. In the two cross-pieces H K, L M, is moved a horizontal axis Q M, by means of the four sails *ah*, *cm*, *Of*, *gh*, exposed to the wind in a proper manner. Upon this axis is fixed a cone of wood, MNO; upon which, as the sails move round, a weight R, or S, is raised by a string round its superfices, proceeding from the smaller to the larger end NO. Upon this larger end or base of the cone, is fixed a rocket wheel *k*, in whose teeth the click X falls, to prevent any retrograde motion from the depending weight.

* Plate XXXI. fig. 3.

The structure of this machine sufficiently shows that it may be accommodated to estimate the variable force of the wind; because the force of the weight will continually increase as the string advances on the conical surface, by acting at a greater distance from the axis of motion; consequently, if such a weight be added on the smaller part M, as will just keep the machine in equilibrio in the weakest wind, the weight to be raised as the wind becomes stronger, will be increased in proportion, and the diameter of the cone N O may be be fo large in comparifon to that of the fmaller end at M, that the ftrongeft wind fhall but juft raife the weight at the greater end.

If, for example, the diameter of the axis be to that of the bafe of the cone N O as 1 to 28; then, if S be a weight of one pound at M on the axis, it will be equivalent to 28 pounds when raifed to the greater end: if, therefore, when the wind is weakeft, it fupports one pound on the axis, it muft be 28 times as ftrong to raife the weight to the bafe of the cone. If therefore a line or fcale of 28 equal parts be drawn on the fide of the cone, the ftrength of the wind will be indicated by that number on which the ftring refts.

ANEMONE, WIND-FLOWER: A genus of the polyginia order, belonging to the polyandria clafs of plants; and, in the natural method, ranking under the 26th order, *Multifilique*. It has its name from the Greek ἄνεμος, fignifying the *wind;* becaufe the flower is fuppofed not to open unlefs the wind blows.—The characters are: There is no *calyx:* The *corolla* confifts of petals of two or three orders, three in each feries, oblongifh: The ftamina confift of numerous capillary filaments; the antheræ didymous and erect. The *piftillum* has numerous germina collected into a head; the ftyli are pointed; the ftamina obtufe: There is no *pericarpium;* the receptaculum is globular: The *feeds* are very numerous.

Of this genus Dr Linnæus enumerates 21 fpecies; but thofe valuable on account of the beauty of their flowers, are only the following, 1. The nemorofa, which grows wild in the woods in many parts of Britain, where it flowers in April and May. The flowers are white, purple, or reddifh purple, fometimes fingle, and fometimes double, fo that they make a pretty appearance. 2. The appennina is likewife a native of Britain, growing in woods. The flowers of this fpecies, like the laft are fometimes fingle, and fometimes double; their colours are white, blue, or violet. They appear in April. 3. The coronaria. 4. The hortenfis. Thefe two are natives of the Levant, particularly of the Archipelago iflands, where the borders of the fields are covered with them of the moft beautiful colours. When they grow wild the flowers are commonly fingle; but by culture they are greatly improved: they become large and double, making fome of the greateft ornaments of gardens. Their principal colours are red, white, purple, and blue; fome of them are finely variegated with with red, white, purple, and many intermediate fhades of thefe colours.

Culture. The firft and fecond forts may be propagated by taking up their roots when the leaves decay, and tranfplanting them in wilderneffes, where they will thrive and increafe greatly, if they are not difturbed. The two laft forts require a good deal of care, and ample directions for their culture.—The foil in which thefe plants will thrive extremely, may be compofed in the following manner: Take a quantity of frefh untried earth (from a common or fome other pafture land) that is of a light fandy loam or hazel mould, obferving not to take it above ten inches deep below the furface; and if the turf be taken with it, the better, provided it hath time to rot thoroughly before it is ufed: mix this with a third part of rotten cow-dung, and lay it in a heap, keeping it turned over at leaft once a month for eight or ten months, the better to mix it, and rot the dung and turf, and to let it have the advantages of the free air. In doing this work, be careful to rake out all the great ftones, and break the clods; but by no means fift or fcreen the earth, which has been found very hurtful to many forts of roots. This earth fhould be mixed twelve months before it is ufed, if poffible: but if conftrained to ufe it fooner, it muft be the oftener turned over to mellow and break the clods; obferving to rake out all the parts of the green fward that are not quite rotten, before it is ufed, as they would be prejudicial to the roots if fuffered to remain. The beginning of September is a proper feafon to prepare the beds for planting, which (if in a wet foil) fhould be raifed with this fort of earth fix or eight inches above the furface of the ground, laying at the bottom fome of the rakings of the heap to drain off the moifture; but, in a dry foil, three inches above the furface will be fufficient; this compoft fhould be laid at leaft two feet and a half thick, and in the bottom there fhould be about four or five inches of rotten neats dung, or the rotten dung of an old melon or cucumber bed. The beds muft be laid (if in a wet foil) a little round, to fhoot off the water; but in a dry one, nearer to a level. In wet land, where the beds are raifed above the furface, it will be proper to fill up the paths between them, in winter, either with rotten tan or dung, to prevent the froft from penetrating into the fides of the beds, which otherwife may deftroy their roots. The earth fhould be laid in the beds at leaft a fortnight or three weeks before the roots are planted, and a longer time would be yet better, that it may fettle; and when they are planted, ftir the upper part of the foil about fix inches deep, with a fpade; then rake it even and fmooth, and with a ftick draw lines each way of the bed at fix inches diftance, fo that the whole may be in fquares, that the roots may be planted regularly: then with three fingers make a hole in the centre of each fquare, about three inches deep, laying therein a root with the eye uppermoft; and when the bed is finifhed, with the head of the rake draw the earth fmooth, fo as to cover the crown of the roots about two inches thick.

The beft feafon for planting thefe roots, if for forward flowers, is about the latter end of September, and for thofe of a middling feafon any time in October: but obferve to perform this work, if poffible, at or near the time of fome gentle fhowers; for if planted when the ground is perfectly dry, and there fhould no rain fall for three weeks or a month after, the roots will be very apt to grow mouldy upon the crown; and if once they get this diftemper, they feldom come to good after.

As all the fine varieties of thefe flowers were firft obtained from feeds, fo no good florift that hath garden-room fhould neglect to fow them; in order to which, he fhould provide himfelf with a quantity of good roots of the fingle (or what the gardeners call *poppy*) anemonies, of the beft colours and fuch as have ftrong ftems and large flowers, but efpecially fuch as have more leaves than common, and alfo other good properties: thefe fhould be planted early, that they may have ftrength to produce good feeds, which will be ripe in three weeks or a month's time after the flowers are paft; when the feeds muft be carefully gathered, otherwife they will be blown away in a fhort time, as being inclofed in a downy fubftance. You muft preferve this feed till the beginning of Auguft, when you may either

Anemone. ther sow it in pots, tubs, or a well-prepared bed of light earth: in the doing of it you must be careful not to let your seeds be in heaps; to avoid which, the best method is to mix them with a little fine sand, and, when sown, gently streak the bed with a strong hair-brush.

In about two months after sowing, the plants will begin to appear, if the season has proved favourable. The first winter after their appearing above ground, they are subject to injuries from hard frosts, or too much wet, against both of which you must equally defend them: for the frost is very apt to loosen the earth, so that the young plants are often turned out of the ground, after which a small frost will destroy them; and too much wet often rots their tender roots, so that all your former trouble may be lost in a short time for want of care in this particular: nor is any thing more destructive to these tender plants than the cold black frosts and winds of February and March, from which you must be careful to defend them, by placing a low reed-fence on the north and east sides of the bed, which may be moveable, and only fastened to a few stakes to support it for the present, and may be taken quite away as the season advances, or removed to the south and west sides of the bed, to screen it from the violence of the sun, which often impairs these plants when young. As the spring advances, if the weather should prove dry, you must gently refresh them with water, which will greatly strengthen the roots; and when the green leaves are decayed, if your roots are not too thick to remain in the same bed another year, you must clear off all the weeds and decayed leaves from the bed, and sift a little more of the same prepared good earth, about a quarter of an inch thick over the surface, and observe to keep them clear from weeds during the summer season, and at Michaelmas repeat the same earthing; but as these roots so left in the ground will come up early in the autumn, the beds should be carefully covered in frosty weather, otherwise their leaves will be injured, whereby the roots will be weakened, if not destroyed. If your roots succeed well, many of them will flower the second year, when you may select all such as you like, by marking them with a stick: but you should not destroy any of them till after the third year, when you have seen them blow strong, at which time you will be capable to judge of their goodness; for until the roots have acquired strength, the flowers will not show themselves to advantage.

The single (or poppy) anemonies will flower most part of the winter and spring when the seasons are favourable, if they are planted in a warm situation, at which time they make a fine appearance; therefore deserve a place in every flower-garden, especially as they require little culture. There are some fine blue colours amongst these single anemonies, which, with the scarlets and reds, make a beautiful mixture; and as these begin flowering in January or February, when the weather is cold, they will continue a long time in beauty, provided the frost is not too severe, or if they are covered with mats. The seeds of these are ripe by the middle or end of May; and must be gathered daily as they ripen, otherwise they will be soon blown away by the winds.

Horned cattle, when removed from the higher grounds into woods and woody pastures, frequently eat the wood-anemone; and, according to Linnæus and Gunner, many observations have proved that it causes the bloody flux among them. Anemone, Anemoscope.

*Sea-*ANEMONE. See ANIMAL-*Flower*.

ANEMOSCOPE, a machine that shows either the course or velocity of the wind. (See also the article *Wind*-GUAGE.)

The machine which shows the course of the wind, or from what point of the compass it blows, consists of an index moving about an upright circular plate, like the dial of a clock, on which the 32 points of the compass are drawn instead of the hours. The index, which points to the divisions on the dial, is turned by a horizontal axis, having a trundle-head at its external extremity. This trundle-head is moved by a cog-wheel on a perpendicular axis; on the top of which a vane is fixed, that moves with the course of the wind, and puts the whole machine in motion. The whole contrivance is extremely simple; and nothing required in the construction, but that the number of cogs in the wheel, and rounds in the trundle head, be equal; because it is necessary, that when the vane moves entirely round, the index of the dial also make a complete revolution.

The anemoscope, calculated for indicating the force or velocity of the wind, is the same with what most writers call an *anemometer;* and we have accordingly described one of those machines under that article. We shall here add another, contrived by the late Mr Pickering, and published in the *Philosophical Transactions*, N° 473.

This anemoscope is a machine four feet and a quarter high, consisting of a broad and weighty pedestal, a pillar fastened into it, and an iron axis of about half an inch diameter fastened into the pillar. Upon this axis turns a wooden tube; at the top of which is placed a vane, of the same materials, 21 inches long, consisting of a quadrant, graduated, and shod with an iron rim, notched to each degree; and a counterpoise of wood, as in the figure, on the other. Through the centre of the quadrant runs an iron pin, upon which are fastened two small round pieces of wood, which serve as moveable radii to describe the degrees upon the quadrant, and as handles to a velum or sail, whose pane is one foot square, made of canvas, stretched upon four battens, and painted. On the upper batten, next to the shod rim of the quadrant, is a small spring which catches at every notch corresponding to each degree, as the wind shall, by pressing against the sail, raise it up; and prevents the falling back of the sail, upon the lessening of the force of the wind. At the bottom of the wooden tube, is an iron index, which moves round a circular piece of wood fastened to the top of the pillar on the pedestal, on which are described the 32 points of the compass. The figure of this machine is given on Plate XXXI. fig. 4. where *a* is the pedestal; *b*, the pillar on which the iron axis is fitted; *c*, the circle of wood, on which are described the 32 points of the compass; *e*, the wooden tube upon its axis; *f*, the velum; *g*, the graduated quadrant; *h*, the counterpoise of the vane. The adjoining figure represents the velum, which takes off: *a* is the plane of the velum; *b*, the spring; *c c*, the wooden radii, *d, d*, the holes through which the pin in the centre of the quadrant goes. Its uses are the following.

1. Ha-

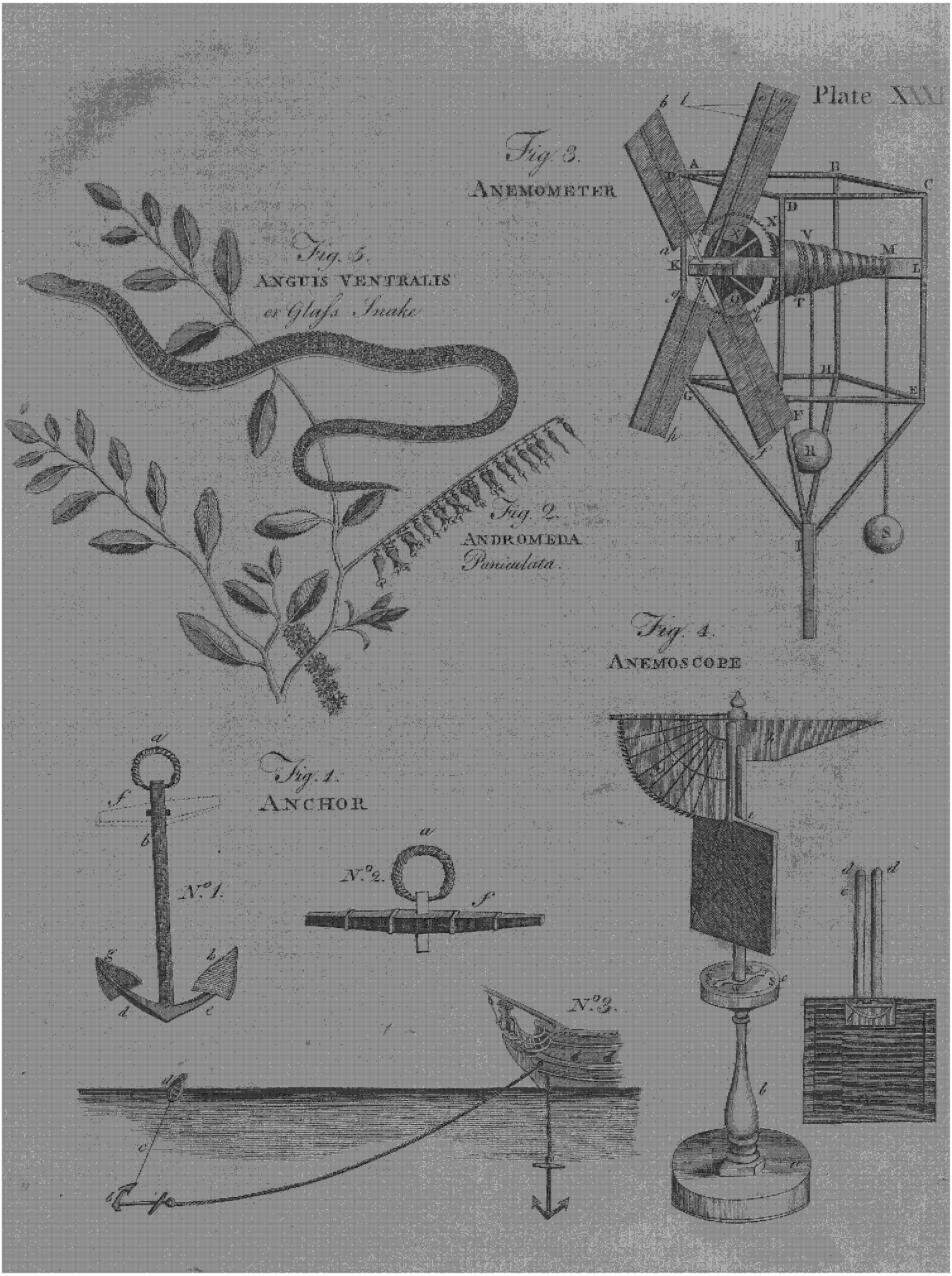


Plate XXXI
Fig. 3.
ANEMOMETER
Fig. 5.
ANGUIS VENTRALIS
or Glass Snake
Fig. 2.
ANDROMEDA
Paniculata.
Fig. 4.
ANEMOSCOPE
Fig. 1.
ANCHOR
N°1.
N°2.
N°3.

1. Having a circular motion round the iron axis, and being furnished with a vane at top, and index at the bottom, when once you have fixed the artificial cardinal points, described on the round piece of wood, on the pillar, to the same quarters of the heavens, it gives a faithful account of that quarter from which the wind blows. 2. By having a velum or sail elevated by the wind along the arch of the quadrant to an height proportionable to the power of the column of wind pressing against it, the relative force of the wind, and its comparative power, at any two times of examination, may be accurately taken. 3. By having a spring fitted to the notches of the iron with which the quadrant is shod, the velum is prevented from returning back upon the fall of the wind; and the machine gives the force of the highest blast, since the last time of examination, without the trouble of watching it.

The ingenious contriver of this machine tells us, that he carefully examined what dependence may be had upon it, during the storms of February 1743-4, and found that it answered exceedingly well; for that, in such winds as the sailors call *violent storms*, the machine had six degrees to spare for a more violent gust, before it comes to a horizontal position. It is certainly to be depended upon in ordinary weather, the velum being hung so tenderly as to feel the most gentle breeze. There is, however, reason to fear, that the exposing the anemoscope to all winds for a continuance, must disorder it, especially irregular blasts and squalls. It may not therefore be amiss, in violent weather, for the observer to take the tube with its vane and velum in his hand, in order to know the force of the wind; and, when he has finished his observations, to carry the machine into the house, till the violence of the storm is abated, when it may be replaced in its former situation.

ANETHUM, DILL and FENNEL: A genus of the digynia order, belonging to the pentandria class of plants; and, in the natural method, ranking under the 45th order, *Umbellatæ*. The essential characters are: The fruit is oval, compressed, striated; and the petals (five) are involute, entire, and very short.

Species. 1. The graveolens, or dill, is an annual plant: the root is long, slender, and white; the leaves are divided into a multitude of fine, long, narrow segments, like those of fennel, but of a bluish green colour, and less strong smell. The stalk is round and firm, growing to the height of four feet, with yellow flowers in moderately large umbels. 2. The feniculum, or fennel; of which there are two varieties, the common and the sweet. The sweet fennel is smaller in all its parts than the common, except the seeds, which are considerably larger. The seeds of the two sorts differ likewise in shape and colour; those of the common are roundish, oblong, flattish on one side, and protuberant on the other, of a dark almost blackish colour; those of the sweet are longer, narrower, not so flat, generally crooked, and of a whitish or pale yellowish colour. Both sorts are cultivated in gardens: the common is a perennial plant: the sweet fennel perishes after it has given seed.

Medicinal Uses. 1. Of the first species, *dill*, only the seeds are used. They are of a pale yellowish colour, in shape nearly oval, convex on one side, and flat on the other. Their taste is moderately warm and pungent; their smell aromatic, but not of the most agreeable kind. Several preparations of them are kept in the shops. They are recommended as a carminative, in flatulent colics, proceeding from a cold cause or a viscidity of the juices.—2. Of *fennel* both the seeds and roots are used in medicine. The seeds of both the fennels have an aromatic smell, and a moderately warm pungent taste: those of the sweet fennel are in flavour most agreeable, and also have a considerable degree of sweetness; hence the use of these only have been directed. They are ranked among the four greater hot seeds, and not undeservedly looked upon as good stomachics and carminatives. A simple water is prepared from them in the shops; they are ingredients also in the compound spirit of juniper, and some other officinal compositions. The root is far less warm, but has more of a sweetish taste, than the seeds; it is one of the five roots called *openers*; and has sometimes been directed in aperient apozems. Boerhaave says, that this root agrees in taste, smell, and medical qualities, with the celebrated *ginseng* of the Chinese; from which, however, it appears to be very considerably different.—The leaves of fennel are weaker than either the roots or seeds, and have very rarely been employed for any medicinal use.

ANEURISM, in surgery, a throbbing tumor, distended with blood, and formed by a dilatation or rupture of an artery. See SURGERY-*Index*.

ANGARI, or ANGARII, in antiquity, denote public couriers appointed for the carrying of messages. The ancient Persians, Budæus observes, had their αγγαρειον δρομημα; which was a set of couriers on horseback, posted at certain stages or distances, always in readiness to receive the dispatches from one, and forward them to another, with wonderful celerity, answering to what the moderns call *posts*. q. d. *positi*, as being posted at certain places or stages.—The angari were also called by the Persians *astandæ*; by the Greeks ημεροδρομοι, on account of the long journeys they made in one day, which, according to Suidas, amounted not to less than 1500 stadia.

ANGARIA, in Roman antiquity, a kind of public service imposed on the provincials, which consisted in providing horses and carriages for the conveyance of military stores, and other public burdens. It is sometimes also used for a guard of soldiers, posted for the defence of a place. In a more general sense, it is used for any kind of oppression or services performed through compulsion.

ANGAZYA, one of the Comorra islands, lying between the north end of Madagascar and the coast of Zanguebar in Africa, from Lat. 10° to 15° S. It is inhabited by Moors, who trade with divers parts of the continent, in cattle, fruits, and other commodities of the island; which they exchange for callicoes and other cotton cloths. The houses here are built of stone, and lime made of calcined oyster-shells; with which the walls and roof are plastered in a very elegant manner. The government of Angazya is a pure aristocracy; the island being subject to 10 lords, who have all the title of *Sultan*. The people are very careful of their women; never permitting strangers to see them, without permission from a sultan, or an order which the ſtranger brings with him. Many of them read and write Arabic with great facility; and ſome even underſtand Portugueſe, which they learn from their intercourſe with Moſambique, whither they trade in veſſels of 40 tons burthen.

ANGEIOTOMY, in ſurgery, implies the opening a vein or artery, as in bleeding: and conſequently includes both arteriotomy and phlebotomy.

ANGEL, a ſpiritual intelligent ſubſtance, the firſt in rank and dignity among created beings. The word *Angel* is Greek, and ſignifies a *Meſſenger*: the Hebrew מלאך ſignifies the ſame thing. The angels are in Daniel (chap. iv. ver. 13, &c.) called עירין, or *Watchers*, from their vigilance: for the ſame reaſon they are, in the remains we have of the prophecy attributed to Enoch, named *Egregori;* which word imports the ſame in Greek.

Angels, therefore, in the proper ſignification of the word, do not import the nature of any being, but only the office to which they are appointed, eſpecially by way of meſſage, or intercourſe between God and his creatures; in which ſenſe they are called the *miniſters of God*, who do his pleaſure, and *miniſtring ſpirits* ſent forth to miniſter for them who ſhall be heirs of ſalvation. That there are ſuch beings as we call *angels*, that is, certain permanent ſubſtances, inviſible, and imperceptible to our ſenſes, endued with underſtanding and power ſuperior to that of human nature, created by God, and ſubject to him as the ſupreme Being; miniſtring to his divine providence in the government of the world by his appointment, and more eſpecially attending the affairs of mankind; is a truth ſo fully atteſted by Scripture, that it cannot be doubted. Nay, the exiſtence of ſuch inviſible beings was generally acknowledged by the ancient heathens, though under different appellations: the Greeks called them *dæmons;* and the Romans *genii*, or *lares*. Epicurus ſeems to have been the only one among the old philoſophers who abſolutely rejected them. Indeed, the belief of middle intelligences influencing the affairs of the world, and ſerving as miniſters or interpreters between God and man, is as extenſive as the belief of a God; having never, ſo far as we know, been called in queſtion by thoſe who had any religion at all.

When created.

The creation of angels is not indeed expreſsly mentioned by Moſes in the firſt of Geneſis, yet is is generally conſidered by judicious expoſitors as implied. The reaſon why the ſacred hiſtorian is ſilent on this ſubject, is ſuppoſed by Berrington to be the natural proneneſs of the Gentile world, and even of the Jews, to idolatry *. And it is thought, if they worſhipped mere material elements, which was the caſe, much more might they be inclined to worſhip ſuch ſuperior and ſublime beings as angels. But a better reaſon is perhaps given by other writers, viz. that this firſt hiſtory was purpoſely and principally for information concerning the viſible world; the inviſible, of which we know but in part, being reſerved for a better life †.

On what day they were created has been matter of conjecture. It is a point on which learned men have differed. The Socinians, indeed, hold, ſays biſhop Hopkins‡, that it was long before the account given by Moſes, but it muſt have been within the ſix days creation; becauſe, as we are informed, that within this ſpace God made heaven and earth, and all things that are therein. All the writers that we have ſeen on this ſubject, think they were included in the firſt day's work, when the heavens were framed.

* On the Creation, p. 81, See alſo Severianus on the Creation.

† Aſſembly's Annot. on Gen. i. 30.

‡ Works, p. 505.

It has been thought by ſome perſons, that the words of Job, "When the morning ſtars ſang together, and all the ſons of God ſhouted for joy," militate againſt the creation of angels within the ſix days. About the meaning of theſe words, however, expoſitors are not agreed; but admitting that they refer literally to angels, Dr Lightfoot, Caryl, and others, ſee no difficulty in the paſſage. The Doctor thinks they were created on the firſt day, with the heavens; and that they were ſpectators of God's works in the other parts of creation, and praiſed and magnified the Lord for his works all along; ſinging and ſhouting when God laid the foundation of the earth, as the Jews did at the laying the foundation of the temple, Ezra iii.

On a ſubject of this nature it would be imprudent to *indulge* a ſpirit of conjecture: Scripture is the only ſtandard by which truth and error can be tried, and to this we muſt ultimately appeal. It is acknowledged that Moſes has not expreſsly mentioned angels by name; yet as we have remarked, their creation is undoubtedly implied; for the heavens muſt include all that are in them; and therefore it is that the divine penman ſays, in the concluſion of his narrative, "Thus the heavens and the earth were finiſhed, and *all* the hoſt of them." Of the *hoſts* of heaven, the angels muſt form a conſiderable part; they are expreſsly called the *heavenly hoſts* and the *armies of heaven*, Dan. iv. 35. Luke ii. 13. And if divine authority be admitted as deciſive, the reaſons adduced by Jehovah for the ſanctification of a ſabbath, demonſtrate that they did not exiſt previous to the creation of the heavens. It is, ſurely, aſſerted with propriety, that in *ſix days* the Lord made heaven and earth, the ſea, and ALL that *in them is*. Similar to which is a declaration of the divine hiſtorian relating to the ſame fact.—"And God bleſſed the ſeventh day and ſanctified it; *becauſe* that in it he had reſted from ALL his work which God created and made," Gen. ii. 3. Now if angels exiſted prior to the ſix days of creation, the language of Moſes is far from being accurate and intelligible; and eſpecially when it is conſidered that the obſcurity might have been removed by adding, "from all the work which God had *then* created and made."

But if angels were created before the heavens, where could they exiſt? For, as the learned Gill § has remarked, "though angels have no bodies, and ſo are not in place circumſcriptively; yet as they are creatures, they muſt have an *ubi*, a ſomewhere, in which they are definitively; ſo that they are here, and not there, and much leſs every where: Now where was there an *ubi*, a ſomewhere, for them to exiſt in, before the heavens and the earth were made? It is moſt reaſonable, therefore to conclude, that as God prepared an habitation for all the living creatures before he made them: as the ſea for the fiſhes, the expanſe, or air, for the fowls, and the earth for men and beaſts; ſo he made the heavens firſt, and then the angels to dwell in them."

§ Bod. Divin. vol. i. p. 412.

That this was the fact, will appear very evident, if the words of Moſes be impartially conſidered. "In the beginning (ſays he), God created the heavens and the earth;" which words muſt refer to either the beginning of *creation* or of *time*: if to the former, and angels previouſly exiſted, the language is neither *intel-*

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ligible nor conformable to *truth*: if to the latter, the difficulty remains; for what is time but the measure of created existence. "Time (says the judicious Charnock*) began with the foundation of the world; before the beginning of the creation and the beginning of time, there could be nothing but eternity; nothing but what was uncreated, that is, nothing but what was without beginning." But if angels were in a pre-existent state, the historian's language is unaccountably strange and inaccurate: for if the phrase *in the beginning*, which is remarkably emphatical, refer to the creation of the heavens and the earth *only*, they are unhappily expressed: so expressed, indeed, as to convey no meaning to those who consider words as the vehicle of thought, and as intended to express clearly to others the meaning of the writer. For the *natural obvious* sense is as follows—"In the beginning of the creation of the heavens and the earth, God created the heavens and the earth;" which language is not only a departure from that perspicuity and precision which distinguish all his narrations, but entirely irrational and absurd.

* Works, vol. i. 112.

That the words *in the beginning* refer to the first creation, cannot be doubted, if it be remembered that Jehovah himself founds a claim to *eternity* on this very ground: "Before the day was, I am he."—"Before the mountains were brought forth, or ever thou hadst formed the earth or the world, even from everlasting to everlasting, thou art God." Isa. xliii. 13. Ps. ix. 2. See also Prov. viii. 22, 23. &c. Now there could be no propriety in this kind of reasoning, if angels or any other creature existed before the creation of the world, because all claims to eternity from such premises would apply even to Gabriel as well as to Jehovah. "Before the world was," is, in Scripture language, a phrase always expressive of eternity; and on this principle the evangelist John asserts the pre-existence of Jesus Christ in the first chapter of his history. For this purpose he alludes to the words of Moses, and introduces his divine master to notice by celebrating the first act of his creative power. "In the beginning (says he) was the Word;" that is, Dr Doddrige remarks §, before the foundation of the world, or the first production of any creature: and Dr Sherlock ‡ is clearly of opinion, that the words, in their most common and usual acceptation, signify the first creation of all things, and are a demonstration of the divinity of Christ. Of the same mind was Dr Owen. He says, that if the phrase *beginning* does not absolutely and formally express *eternity*, yet it doth a pre-existence to the whole creation, which amounts to the same thing; for nothing can pre-exist before all creatures but the nature of God, which is eternal, unless we suppose a creature before the creation of any. But what is meant by this expression is fully declared by other passages of Scripture: "I was set up from everlasting, before the *beginning*, or ever the earth was:" "Glorify thou me with thine own self, with the glory which I had with thee before the world was;" both which passages not only explain the text, but undeniably prove the pre-existence of Christ the son of God*. It should be remembered, that, in the passage under consideration, the Evangelist's argument for the *divinity* of Jesus Christ is grounded on his pre-existing the creation of the world; and it is consequently asserted, that he is the creator of all things: but if angels had a being before the period to which he alludes, the argument loses all its force, and no more proves the divinity of Christ than the divinity of an angel (A).

§ Family Expositor.

‡ Script Proof. of Christ's Divin. p. 129. See also Whitby on John i. 1.

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* On the Trinity, p. 43.

If, therefore, the words of Moses be impartially viewed in their obvious natural meaning, and compared with other passages of Scripture that relate to the same subject, we have no doubt, but every unprejudiced mind will perceive, that as he intended to give a summary history of the creation of all things both in heaven and in earth, he has done it in language intelligible and accurate, and in terms sufficiently explicit.

As to the nature of these beings, we are told, that they are spirits: but whether pure spirits divested of all matter, or united to some thin bodies, or corporeal vehicles, has been a controversy of long standing. Not only the ancient philosophers, but some of the Christian fathers were of opinion, that angels were cloathed with ethereal, or fiery, bodies, of the same nature with those which we shall one day have when we come to be equal to them. But the more general opinion especially of later times, has been, that they are substances entirely spiritual, though they can at any time assume bodies, and appear in human or other shapes.

Their nature, power, employment, &c.

That the angelical powers and abilities vastly excel those of man, cannot be denied, if we consider, that their faculties are not clogged or impeded, as ours are, by any of those imperfections which are inseparable from corporeal being; so that their understandings are always in perfect vigour; the inclinations regular; their motions strong and quick; their actions irresistable by material bodies, whose natural qualities they can controul, or manage to their purposes, and occasion either blessings or calamities, public or private, here below; instances of which are too numerous to mention.

Besides their attendance on God, and their waiting and executing of his commands, they are also presumed to be employed in taking care of mankind and their concerns: and that every man had such a tutelar or guardian angel, even from his birth, was a firm belief and tradition among the Jews; and our Saviour himself seems to have been of the same sentiment. The heathens were also of the same persuasion, and thought it a crime to neglect the admonitions of so divine a guide. Socrates publicly confessed himself to be under the direction of such an angel, or dæmon, as several others have since been. And in this tutelar genius of each person they believed his happiness and fortune depended. Every genius did his best for the interest of his client; and if a man came by the worst, it was a sign the strength of his genius was inferior to that

(A) Of this Socinus and his followers were aware; and therefore artfully endeavoured to evade the force of the apostle's reasoning, by interpreting the phrase *in the beginning* either in a figurative sense, or as referring to the beginning of John the Baptist's ministry. We will only subjoin, that we do not remember to have seen any writer deviate from the primary obvious meaning of the passage, who had not some hypothesis to support inimical to truth.

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that of his opponent, that is, of an inferior order; and this was governed by chance. There were some genii, whose ascendency was so great over others, that their very presence entirely disconcerted them; which was the case of that of Augustus in respect to that of Marc Antony: and for the same reason, perhaps, some persons have wit, and speak well, when others are absent, in whose presence they are confounded, and out of countenance. The Romans thought the tutelar genii of those who attained the empire, to be of an eminent order; on which account they had great honours shown them. Nations and cities also had their several genii. The ancient Persians so firmly believed the ministry of angels, and their superintendance over human affairs, that they gave their names to their months, and the days of their month; and assigned them distinct offices and provinces: and it is from them the Jews confess to have received their names of the months and angels, which they brought with them when they returned from the Babylonish captivity. After which, we find, they also assigned charges to the angels, and in particular the patronage of empires and nations; Michael being the prince of the Jews, as Raphael is supposed to have been of the Persians.

The Mahometans have so great a respect for the angels, that they account a man an infidel who either denies their existence, or loves them not. They believe them to be free from sin, enjoying the presence of God, to whom they are never disobedient: and they have subtile pure bodies, being created of light; and have no distinction of sexes, nor do they need the refreshment of food or sleep. They suppose them to have different forms and offices: that some adore God in several postures; others sing his praises, and intercede for men: some carry and encompass his throne; others write the actions of men, and are assigned guardians of them.

As the number of these celestial spirits is very great, it is likewise reasonable to believe that there are several orders and degrees among them; which is also confirmed by Scripture; whence some speculative men have distributed them into nine orders, according to the different names by which they are there called; and reduced those orders into three *hierarchies*, as they call them: to the first of which belong seraphim, cherubim, and thrones; to the second, dominions, virtues, and powers; and to the third, principalities, arch-angels, and angels. They imagine farther, that there are some who constantly reside in heaven; others who are ministers, and sent forth, as there is occasion, to execute the orders they receive from God by the former. The Jews reckon but four orders or companies of angels, each headed by an arch-angel; the first order being that of Michael, the second of Gabriel, the third of Uriel, and the fourth of Raphael: but though the Jews believe them to be four, yet it seems there were rather seven. The Persians also held, there were subordinate degrees among the angels.

Of the fallen angels.

Although the angels were originally created perfect, good, and obedient to their master's will, yet some of them sinned, and kept not their first estate, but left their habitation; and so, of the most blessed and glorious became the most vile and miserable of all God's creatures. They were expelled the regions of light, and cast down to hell, to be reserved in everlasting chains under darkness, until the day of judgement. With heaven they lost their heavenly disposition, which delighted once in doing good and praising God; and fell into a settled rancour against him, and malice against men: their inward peace was gone; all desire of doing good departed from them; and, instead thereof, revengeful thoughts and despair took possession of them, and created an eternal hell within them.

When, and for what offence, these apostate spirits fell from heaven and plunged themselves into such an abyss of wickedness and wo, are questions very hard, if not impossible, to be determined by any clear evidence of Scripture. As to the time, we are certain that it could not be before the sixth day of creation; because on that day it is said, "God saw every thing that he had made, and behold it was very good:" but that it was not long after is very probable, as it must have preceded the fall of our first parents. Some have imagined it to have been after; and that carnality, or lusting to converse with women upon earth, was the sin which ruined them: an opinion (B) built on a mistaken interpretation of Scripture, as if angels were meant by *the sons of God* who are said to have begotten the mighty men of old on the daughters of men. Others have supposed, that the angels, being informed of God's intention to create man after his own image, and to dignify his nature by Christ's assuming of it, and thinking their glory to be eclipsed thereby, envied man's happiness, and so revolted: and with this opinion that of the Mahometans has some affinity; who are taught, that the devil, who was once one of those angels who are nearest God's presence, and named *Azazil*, forfeited paradise for refusing to pay homage to Adam at the command of God. But on what occasion soever it first showed itself, pride seems to have been the leading sin of the angels; who, admiring and valuing themselves too much on the excellence of their nature and the height of their station, came at length to entertain so little respect for their Creator

(B) This opinion seems to have been originally occasioned by some copies of the Septuagint, which, in the days of St Austin, had in this place *the angels of God*. Lactantius supposes the angels, who were guilty of this enormity, had been sent down by God to guard and take care of mankind; and being endued with free-will, were charged by him not to forfeit the dignity of their celestial nature, by defiling themselves with the corruptions of the earth; but that the devil at length enticed them to debauch themselves by women. He adds, that, being not admitted into heaven by reason of the wickedness into which they had plunged themselves, they fell down to the earth, and became the devil's ministers; but that those that were begotten by them, being neither angels nor men, but of a middle nature, were not received into hell, no more than their parents were into heaven. Hence arose two kinds of dæmons, celestial and terrestial. These are unclean spirits, the authors of whatever evils are committed, and whose prince is the devil. From hence very probably proceeded the notion of *Incubi*, or dæmons who are supposed to have carnal knowledge of women.

Creator, as to be guilty of downright rebellion and apostacy.

It is certain from Scripture, that the fallen angels were in great numbers, and that there were also some order and subordination preserved among them; one especially being considered as their prince, and called by several names, *Beelzebub, Satan*, or *Sammaël* by the Jews; *Ahârimam*, by the Persians; and *Eblis*, by the Mahometans. Their constant employment is, not only doing evil themselves, but endeavouring by all arts and means to seduce and pervert mankind, by tempting them to all kind of sin, and thereby bringing them into the same desperate state with themselves.

Angel is likewise a title given to bishops of several churches. In this sense is St Paul understood by some authors, where he says, *Women ought to be covered in the church, because of the angels.* The learned Dr Prideaux observes, that the minister of the synagogue, who officiated in offering up the public prayers, being the mouth of the congregation, delegated by them as their representative, messenger, or angel, to speak to God in prayer for them, was therefore, in the Hebrew language, called the *angel* of the church; and from thence the bishops of the seven churches of Asia are, by a name borrowed from the synagogue, called the *angels* of those churches.

Angel, in commerce, the name of a gold coin formerly current in England. It had its name from the figure of an angel represented upon it, weighed four pennyweights, and was twenty-three and a half carats fine. It had different values in different reigns; but is at present only an imaginary sum, or money of account, implying ten shillings.

Angel-Fish, in ichthyology, a species of squalus. See Squalus.

ANGELIC, or Angelical, something belonging to, or that partakes of the nature of angels. We say an *angelical* life, &c. St Thomas is styled the *angelical doctor*. The angelical salutation is called by the Romanists *Ave Maria*; sometimes simply *angelus*.

Angelic Garment (Angelica vestis), in ancient times, was a monkish garment, which laymen put on a little before their death, that they might have the benefit of the prayers of the monks. It was from them called *angelical*, because they were called *angeli* who by these prayers *animæ saluti succurrebant*. Hence, where we read the phrase *monachus ad succurrendum* in old books, it must be understood of one who had put on the habit when he was at the point of death.

ANGELICA: A genus of the digynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 45th order *Umbellatæ*. The essential characters are: The fruit is roundish, angled, solid, with reflected styli; the corollæ are equal, and the petals incurvated.

Species. 1. The sativa, or common angelica, which is cultivated in gardens for medicinal use, and likewise for a sweetmeat, grows naturally in the northern countries. The root of this species is brown, oblong, and an inch or two thick, fragrant, and acrid. The leaves are very large, composed of pinnated folia, of an oblong oval figure, dentated at the edge, and the odd leaf at the end of the pinna lobated; the stalk is round, striated, and as thick as a child's arm. The umbels are very large, and of a globose figure; the flowers very small and greenish. 2. The arch-angelica is a native of Hungary and Germany. The leaves are much larger than those of the former, and the flowers are yellow. 3. The sylvestris grows naturally in moist meadows, and by the sides of rivers, in many parts of Britain; so is seldom admitted into gardens. 4. The atro-purpurea canadensis; 5. The lucida canadensis: These are natives of North America, but have neither beauty nor use.

Culture. The common angelica delights to grow in a moist soil: the seeds should be sown soon after they are ripe. When the plants come up about six inches high they should be transplanted very wide, as their leaves spread greatly. If they are planted on the sides of ditches or pools of water, about three feet distance, they will thrive exceedingly.

Medicinal Uses. For the purposes of medicine, Bohemia and Spain produces the best kinds of angelica. The London college direct the roots brought from Spain to be alone made use of. Angelica roots are apt to grow mouldy, and to be preyed upon by insects, unless thoroughly dried, kept in a dry place, and frequently aired. It is probable that the roots which are subject to this inconvenience might be preserved, by dipping them in boiling spirit, or exposing them to its steam after they are dried.

All the parts of angelica, especially the root, have a fragrant aromatic smell, and a pleasant bitterish warm taste, glowing upon the lips and palate for a long time after they have been chewed. The flavour of the seeds and leaves is very perishable, particularly that of the latter, which, on being barely dried, lose the greatest part of their taste and smell: the roots are more tenacious of their flavour, though even these lose part of it upon keeping. The fresh root, wounded early in the spring, yields an odorous yellow juice, which slowly exsiccated, proves an elegant gummy resin, very rich in the virtues of the angelica. On drying the root, this juice concretes into distinct moleculæ, which, on cutting it longitudinally, appear distributed in little veins: in this state, they are extracted by pure spirit, but not by watery liquors.

Angelica is one of the most elegant aromatics of European growth, though little regarded in the present practice. The root, which is the most efficacious part, is used in the aromatic tincture; and the stalks make an agreeable sweetmeat.

ANGELICS (Angelici), in church history, an ancient sect of heretics, supposed by some to have got this appellation from their excessive veneration of angels; and by others from their maintaining that the world was created by angels.

Angelics is also the name of an order of knights, instituted in 1191, by Angelus Flavius Comnenus, emperor of Constantinople.

Angelics is also a congregation of nuns, founded at Milan in 1534, by Louisa Torelli, countess of Guastalla. They observe the rule of St Augustine.

ANGELITES, in ecclesiastical history, a sect of Christian heretics, in the reign of the emperor Anastasius, and the pontificate of Symmachus, about the year 494, so called from Angelium, a place in the city of Alexandria, where they held their first meetings. They were called likewise *Severites*, from one Severus, who was the head of their sect; as also *Theodosians*, from one

one among them named Theodosius, whom they made pope at Alexandria. They held, that the persons of the Trinity are not the same; that none of them exists of himself, and of his own nature; but that there is a common god or deity existing in them all, and that each is God, by a participation of this deity.

ANGELO (Michael). There were five celebrated Italian painters of this name, who flourished in the 16th and 17th centuries; but the two most distinguished of them are these.—First, Michael Angelo Buonarroti, who was a most incomparable painter, sculptor, and architect, born in 1474, in the territory of Arezzi in Tuscany. He was the disciple of Dominico Ghirlandaio; and erected an academy of painting and sculpture in Florence, under the protection of Lorenzo di Medicis; which, upon the troubles of that house, was obliged to remove to Bologna. About this time he made an image of Cupid, which he carried to Rome, broke off one of its arms, and buried the image in a place he knew would soon be dug up, keeping the arm by him. It was accordingly found, and sold to Cardinal St Gregory for an antique; until Michael, to their confusion and his own credit, discovered his artifice, and confirmed it by the deficient arm which he produced: it is rather unusual for the manufacturers of antiques to be so ingenuous. His reputation was so great at Rome, that he was employed by pope Sixtus to paint his chapel; and by the command of Pope Paul III. executed his most celebrated piece *The last judgment*. He has the character of being the greatest designer that ever lived; and it is universally allowed that no painter ever understood anatomy so well. He died immensely rich at Rome, in 1564.—Secondly, Michael Angelo de Caravaggio, born at that village in Milan, in 1569. He was at first no more than a bricklayer's labourer: but he was so charmed with seeing some painters at work, that he immediately applied himself to the art; and made such a progress in a few years, that he was admired as the author of a new style in painting. It was observed of Michael Angelo Buonarotti, that he was incomparable in designing, but knew little of colouring; and of Caravaggio, that he had as good a goût in colouring as he had a bad one in designing. There is one picture of his in the Dominican church at Antwerp, which Reubens used to call his master. It is said of this painter, that he was so strangely contentious, that the pencil was no sooner out of his hand but his sword was in it. He died in 1609.

ANGELO (St) a small but strong town of Italy, in the Capitanata. There are several other towns and castles of the same name in Italy, and particularly the castle of St Angelo at Rome. E. Long. 15. 56. N. Lat. 41. 43.

ANGELOS (Los), a province of Mexico, the ancient republic of Tlascala, of which a city called *Tlascala* was once the capital. That city is now reduced to an inconsiderable village, and has given place to another called *Puebla des los Angelos*, or the city of Angels. It is situated in W. Long. 103. 12. and N. Lat. 19. 13. It was formerly an Indian town; but in 1530 was entirely abandoned by the natives, on account of the cruelties of the Spaniards. A succeeding viceroy of Mexico, by a milder treatment, recalled them; and the town is now exceedingly rich and populous, so as even to vie with Mexico itself in magnificence. It is situated on the river Zacatula, in a fine valley, about 25 leagues to the eastward of Mexico. In the middle is a beautiful and spacious square, from whence run the principal streets in direct lines, which are crossed by others at right angles. One side is almost entirely occupied by the magnificent front of the cathedral; while the other three consist of piazzas, under which are the shops of tradesmen. The city is the see of a bishop, suffragan to the archbishop of Mexico, and we may form a judgment of the wealth of the place by the revenue of the cathedral and chapter, which amounts to 300,000 pieces of eight annually. It must be remembered, however, that in all popish countries the wealth of the laity by no means bears a due proportion to that of the clergy. What contributes greatly to increase the riches of this province is, that here is situated the city of Vera Cruz, the natural centre of all the American treasures belonging to Spain. See Vera Cruz.

ANGELOT, an ancient English gold coin, struck at Paris, while under subjection to the English. It was thus called from the figure of an angel supporting the escutcheon of the arms of England and France. There was another coin of the same denomination struck under Philip de Valois.

Angelot is also used in commerce to denote a small fat, rich sort of cheese, brought from Normandy. Skinner supposes it to have been thus called from the name of the person who first made up in that form, and perhaps stamped it with his own name. Menage takes it to have been denominated from the resemblance it bears to the English coin called *angelot*. It is made chiefly in the Pays de Bray, whence it is also denominated *angelot de Bray*. It is commonly made in vats, either square or shaped like a heart.

ANGER, a violent passion of the mind, consisting in a propensity to take vengeance on the author of some real or supposed injury done to the offended party.

Anger is either deliberative or instinctive; and the latter kind is rash and ungovernable, because it operates blindly, without affording time for deliberation or foresight. Bishop Butler very justly observes, that anger is far from being a selfish passion, since it is naturally excited by injuries offered to others as well as to ourselves; and was designed by the Author of nature not only to excite us to act vigorously in defending ourselves from evil, but to interest us in the defence or rescue of the injured and helpless, and to raise us above the fear of the proud and mighty oppressor.

Neither, therefore, is all anger sinful: hence the precept, "Be ye angry and sin not."—It becomes sinful, however, and contradicts the rule of scripture, when it is conceived upon slight and inadequate provocations, and when it continues long. It is then contrary to the amiable spirit of charity, which "suffereth long, and is not easily provoked." Hence these other precepts, "Let every man be slow to anger;" and, "Let not the sun go down upon your wrath."

These precepts, and all reasoning indeed upon the subject, suppose the passion of anger to be within our power: and this power consists not so much in any faculty we have of appeasing our wrath at the time (for we are passive under the smart which an injury or affront occasions, and all we can then do is to prevent its breaking out into action), as in so mollifying our

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minds by habits of juſt reflection, as to be leſs irritated by impreſſions of injury, and to be ſooner pacified.

As reflections proper for this purpoſe, and which may be called the *ſedatives* of anger, the following are ſuggeſted by Archdeacon Paley in his excellent treatiſe of *Moral and Political Philoſophy**—"The poſſibility of miſtaking the motives from which the conduct that offends us proceeded; how often *our* offences have been the effect of inadvertency, when they were miſtaken for malice; the inducement which prompted our adverſary to act as he did, and how powerfully the ſame inducement has, at one time or other, operated upon ourſelves; that he is ſuffering perhaps under a contrition, which he is aſhamed, or wants opportunity, to confeſs; and how ungenerous it is to triumph by coldneſs or inſult over a ſpirit already humbled in ſecret; that the returns of kindneſs are ſweet, and that there is neither honour, nor virtue, nor uſe, in reſiſting them —for ſome perſons think themſelves bound to cheriſh and keep alive their indignation, when they find it dying away of itſelf. We may remember that others have their paſſions, their prejudices, their favorite aims, their fears, their cautions, their intereſts, their ſudden impulſes, their varieties of apprehenſion, as well as we: we may recollect what hath ſometimes paſſed in our own minds, when we have got on the wrong ſide of a quarrel, and imagine the ſame to be paſſing in our adverſary's mind now; when we became ſenſible of our miſbehaviour, what palliations we perceived in it, and expected others to perceive; how we were affected by the kindneſs, and felt the ſuperiority, of a generous reception and ready forgiveneſs; how perſecution revived our ſpirits with our enmity, and ſeemed to juſtify the conduct in ourſelves which we before blamed. Add to this, the indecency of extravagant anger; how it renders us, whilſt it laſts, the ſcorn and ſport of all about us, of which it leaves us, when it ceaſes, ſenſible and aſhamed; the inconveniencies and irretrievable miſconduct into which our iraſcibility has ſometimes betrayed us: the friendſhips it has loſt us; the diſtreſſes and embarraſſments in which we have been involved by it, and the ſore repentance which on one account or other it always coſt us.

* Book III. part ii. chap. 7.

"But the reflection calculated above all others to allay that haughtineſs of temper which is ever finding out provocation, and which renders anger ſo impetuous, is that which the goſpel propoſes; namely, that we ourſelves are, or ſhortly ſhall be, ſuppliants for mercy and pardon at the judgment-ſeat of God. Imagine our ſecret ſins all diſcloſed and brought to light; imagine us thus humbled and expoſed; trembling under the hand of God; caſting ourſelves on his compaſſion; crying out for mercy—imagine ſuch a creature to talk of ſatisfaction and revenge, refuſing to be intreated, diſdaining to forgive, extreme to mark and to reſent what is done amiſs: imagine, I ſay, this; and you can hardly feign to yourſelf an inſtance of more impious an unnatural arrogance."

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Phyſicians and naturaliſts afford inſtances of very extraordinary effects of this paſſion. Borrichius cured a woman of an inveterate tertian ague, which had baffled the art of phyſic, by putting the patient in a furious fit of anger. Valeriola made uſe of the ſame means, with the like ſucceſs, in a quartan ague. The ſame paſſion has been equally ſalutary to paralytic, gouty, and even dumb perſons; to which laſt it has ſometimes given the uſe of ſpeech. Etmuller gives divers inſtances of very ſingular cures wrought by anger; among others, he mentions a perſon laid up in the gout, who, being provoked by his phyſician, flew upon him, and was cured. It is true, the remedy is ſomewhat dangerous in the application, when a patient does not know how to uſe it with moderation. We meet with ſeveral inſtances of princes to whom it has proved mortal; *e. g.* Valentinian the firſt, Wenceſlas, Matthius, Corvinus king of Hungary, and others. There are alſo inſtances wherein it has produced the epilepſy, jaundice, cholera morbus, diarrhœa, &c. In fact, this paſſion is of ſuch a nature, that it quickly throws the whole nervous ſyſtem into preternatural commotions, by a violent ſtricture of the nervous and muſcular parts; and ſurpriſingly augments not only the ſyſtole of the heart and of its contiguous veſſels, but alſo the tone of the fibrous parts in the whole body. It is alſo certain, that this paſſion, by the ſpaſmodic ſtricture it produces in the parts, exerts its power principally on the ſtomach and inteſtines, which are highly nervous and membranous parts; whence the ſymptoms are more dangerous, in proportion to the greater conſent of the ſtomach and inteſtines with the other nervous parts, and almoſt with the whole body.—The unhappy influence of anger likewiſe, on the biliary and hepatic ducts, is very ſurpriſing; ſince, by an intenſe conſtriction of theſe, the liver is not only rendered ſcirrhous, but ſtones alſo are often generated in the gall-bladder and biliary ducts: theſe accidents have ſcarce any other origin than an obſtruction of the free motion and efflux of the bile, by means of this violent ſtricture. From ſuch a ſtricture of theſe ducts likewiſe proceeds the jaundice, which in proceſs of time lays a foundation for calculous concretions in the gall-bladder. Laſtly, by increaſing the motion of the fluid, or the ſpaſms of the fibrous parts, by means of anger, a larger quantity of blood is propelled with an impetus to certain parts; whence it happens that they are too much diſtended, and the orifices of the veins diſtributed there opened. It is evident from experience, that anger has a great tendency to excite enormous hæmorrhagies, either from the noſe, the aperture of the pulmonary artery, the veins of the anus; or in women, from the uterus, eſpecially in thoſe previouſly accuſtomed and diſpoſed to ſuch evacuations.

END OF THE FIRST VOLUME.

DIRECTIONS FOR PLACING THE PLATES OF VOL. I.